ARMY ORDNANCE

VOL. XIV, No. 81 NOVEMBER-DECEMBER, 1933

Cavalry "Marches" on Wheels

Henry Cabot Lodge, Jr.

Proof Tests and Proof Marks

Calvin Goddard

Gas Masks

Alden H. Waitt

A Miniature French 75

D. A. Gurney and T. A. Conlon

The Broad Arrow

O. F. G. Hogg

Now for Repeal of Twaddle!

An Editorial

A BIMONTHLY REVIEW OF AMERICAN MUNITIONS
PUBLISHED BY THE ARMY ORDNANCE ASSOCIATION, WASHINGTON, D. C.

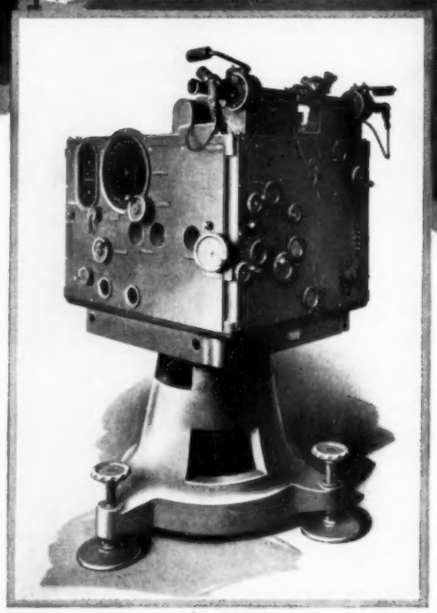
MODERN FIRE CONTROL

TO-DAY is the Era of Mechanization.

High-speed moving targets make artillery fire ineffective unless controlled by modern equipment. Manual fire-control methods have been revised in an attempt to direct the fire of artillery against mechanized forces. However, it is agreed that an automatic control is highly desirable and it is usually considered essential.

Efficiency demands that the modern battery of artillery shall be capable of going into action against either rapidly moving land forces or high-speed aircraft.

The Sperry Universal Director is the only instrument which correctly calculates the firing data for the battery by tracking any such target from a remote observing station.



Sperry Universal Director

SPERRY GYROSCOPE CO., *Inc.*

BROOKLYN — NEW YORK

ARMY ORDNANCE

The Journal of the Army Ordnance Association

Now in its Fourteenth Year of Publication

Pledged to Public Service in Effecting Industrial Preparedness for War as Our Strongest Guarantee of Peace

Published by the Army Ordnance Association, Suite 805, The Mills Building, Washington. D. C. Managing Editor: L. A. Codd Authors alone are responsible for statements made and opinions expressed in their respective articles. Copyright, 1933, by the Army Ordnance Association, Washington, D. C.

Issued Bimonthly. Single Copy 75c (by mail). Subscription rate: Continental U. S. $4.50 annually, foreign $5.00, in advance. Entered as second-class matter August 14, 1920, at the Post Office at Washington, D. C., under the Act of March 3, 1879. Additional second class entry at the Post Office at Richmond, Va.

Volume XIV **NOVEMBER-DECEMBER, 1933** **No. 81**

CONTENTS

		Page
Dawn Patrol		Frontispiece
Cavalry "Marches" on Wheels	By Henry Cabot Lodge, Jr.	135
Proof Tests and Proof Marks	By Calvin Goddard	140
A. D. 1936	By Robert J. Icks	149
Gas Masks	By Alden H. Waitt	150
Inspecting Munitions Production	By Roy D. Burdick	156
A Miniature French 75	By D. A. Gurney and T. A. Conlon	158
The Broad Arrow	By O. F. G. Hogg	161
News and Views of National Defense (Pictorial)		164
Editorial		165
For Non-Combat Motor Vehicles—Technical Building Program—The Field Artillery Trainer—"No Soldier Would Start a New War"—Good Work, General MacArthur!—NRA and War Capacity—Red Tape and Rat Traps—Military Reporting—Now for Repeal of Twaddle.		
Association Affairs		172
Col. Richard H. Hawkins—Members of Industrial Advisory Board—Cincinnati Post—Lieut. Col. Charles E. Fuller at M. I. T.—Retirements of General Winans, Colonel Ames and Major Hoisington—New Members—Necrology.		
Professional Notes		175
Bullets of Light—Technical Notes—Electrical Standardization—A Good Tractor Test—Admiral Stanley on the Navy—A Great Historian—Cost of Germany's Rearmament—Mechanization in Australia.		
Book Reviews		178
Index of Advertisers		191

"Our land and naval forces should be moderate, but adequate to the necessary purposes—the former to garrison and preserve our fortifications and to meet the first invasion of a foreign foe, and, while constituting the elements of a greater force, to preserve the science as well as all the necessary implements of war in a state to be brought into activity in the event of war; the latter, retained within the limits proper in a state of peace, might aid in maintaining the neutrality of the United States with dignity in the wars of other powers and in saving the property of their citizens from spoliation."—*President James Monroe, First Inaugural Address, March 4, 1817.*

The Army Ordnance Association

THE Army Ordnance Association is a national organization of American citizens pledged to industrial preparedness for war as our nation's strongest guarantee of peace.

The Association endeavors to keep alive an interest in and knowledge of the design, production and maintenance of munitions. Other than a few manufacturing arsenals—six in all—there is no peace-time industry for the production of ordnance. Should war unhappily come again, industrial America will be called upon to produce munitions in great quantity and of intricate and unusual design. In an emergency time will not permit careful study or long preparation for the production of munitions. The problem is one of vital concern.

THE Army Ordnance Association believes that the solution of this problem, based on experience, lies in an active organization at all times coöperating with the Government. The principal objective of the Association is an active membership of American citizens, on whom the duty of design and production of munitions will fall in war, who will have an accurate and authentic knowledge of the complex requirements of ordnance. "Peace insurance" in this form is the foremost aim of the Army Ordnance Association.

The Association is purely patriotic; it has no commercial interests, no political alliances, and no religious affiliations. It is not operated for profit: its income is expended in furthering its aims. Its officers and directors serve without remuneration.

ARMY ORDNANCE, the journal of the Association, is published solely for the purpose of disseminating information on the progress of our munitions developments so that American industry may at all times know its responsibilities to the common defense.

The objectives of the Association as set forth in its Constitution are:

To assist in effecting industrial preparedness for war as being one of the nation's strongest guarantees of peace;

To keep available the highly specialized knowledge necessary for arming the manhood of the nation by stimulating interest in the design and production of ordnance material;

To promote mutual understanding and to effect cooperation with American scientists, inventors, engineers and manufacturers in civil life and the regular and reserve officers of the Ordnance Department.

To provide, when required, the services of competent committees to investigate and report upon special ordnance subjects;

To assist in developing and maintaining an efficient personnel, both commissioned and enlisted, for the units required for Ordnance Field Service in the event of an emergency;

To commemorate the services rendered by the industry of the nation and by the officers and civilian employees of the Ordnance Department in the wars in which the United States has been engaged.

OFFICERS

President: BENEDICT CROWELL, Cleveland, Ohio
1st Vice-President: WILLIAM W. COLEMAN, Milwaukee, Wis.
2nd Vice-President: WILLIAM C. SPRUANCE, Wilmington, Del.
Treasurer: CHAS. ELLIOT WARREN, New York, N. Y.
Counsel: JOHN ROSS DELAFIELD, New York, N. Y.

DIRECTORS

SAMUEL MCROBERTS, New York, N. Y.
ROBERT P. LAMONT, Chicago, Ill.
FRANK A. SCOTT, Cleveland, Ohio
C. L. HARRISON, Cincinnati, Ohio
JAMES L. WALSH, Detroit, Mich.
BRUCE CORNWALL, San Francisco, Calif.
CHARLES H. TENNEY, Springfield, Mass.
HARRY SCULLIN, St. Louis, Mo.
PLINY E. HOLT, Stockton, Calif.
R. M. DRAVO, Pittsburgh, Pa.
JOHN C. JONES, Philadelphia, Pa.
E. A. MULLER, Cincinnati, Ohio
C. C. WILLIAMS, Washington, D. C.
JOHN S. SEWELL, Birmingham, Ala.

Executive Secretary: L. A. CODD
Executive Offices: Mills Building, Pennsylvania Avenue at 17th Street, Washington, D. C.

Local Posts of the Association

THERE are eleven local posts of the Association organized for the more intimate professional contact of members in the achievement of the purposes of the organization. All Association members may affiliate with posts of the locality in which they reside.

New York, Established June 15, 1921

President: Samuel McRoberts. 1st Vice-President: H. B. Machen. 2nd Vice-President: F. W. Roller. 3rd Vice-President: J. E. McNary. 4th Vice-President: Robert Boettger. Executive Committee: The Officers and Charles Elliot Warren, John Ross Delafield, C. W. Rice, T. A. Morgan, James L. Walsh and N. F. Ramsey. Treasurer: C. Wingate Reed. Secretary: H. K. Rutherford, 39 Whitehall Street, New York City.

California, Established October 17, 1923

President: Pliny E. Holt. Vice-President: Charles N. Black. Directors: D. C. Jackling, W. H. Oliver, L. F. Fuller, J. J. Thomas, M. M. Mitchell, Bruce Cornwall, Theodore J. Hoover, Samuel Kahn. Secretary-Treasurer: C. C. Harshman, 58 Sutter Street, San Francisco, Calif.

Chicago, Established May 3, 1924

President: A. K. Hamilton. Vice-President: W. R. Wright. Directors: E. A. Russell, George E. Scott, G. G. Thorp, F. A. Lorenz, W. H. Damon, C. E. Heimbrodt, W. B. Hobbs, F. W. Parker. Treasurer: W. H. Damon. Secretary: M. K. Barroll, Jr., 600 W. Jackson Boulevard, Chicago, Ill.

Boston, Established June 30, 1925

President: R. F. Whitelegg. Vice-President: R. E. Goho. Directors: Everett Morss, Charles E. Cowdrey, Clark S. Robinson, Lyman M. Dawes, H. C. Dodge. Treasurer: Archibald McMillan. Secretary: Roger Taylor, 2004 Post Office and Court House Building, Boston, Mass.

Washington, Established November 18, 1925

President: Earl McFarland. Vice-Presidents: Henry P. Erwin, Chas. E. Munroe. Directors: C. C. Williams, Robert P. Lamont, Swagar Sherley, Howard Bruce, Geo. B. McClellan, Fred E. Wright, Leroy Hodges. Treasurer: C. E. McRae. Secretary: H. A. Strong, Munitions Building, Washington, D. C.

Cincinnati, Established December 10, 1925

President: E. A. Muller. Vice-President: S. M. Rowe. Directors: C. L. Harrison, C. W. Verity, W. C. James, J. T. Faig, A. H. Pugh, R. T. Hazelton, F. V. Geier, E. E. Stokes. Secretary-Treasurer: Chas. A. Walker, 730 Transportation Building, Cincinnati, Ohio.

Philadelphia, Established December 9, 1926

President: Philip H. Gadsden. Vice-Presidents: William C. Spruance, Charles Z. Tryon. Directors: J. W. Rawle, Thomas S. Gates, William D. Burk, John P. Sykes, J. W. Robbins, J. L. Poultney. Secretary-Treasurer: W. L. Clark, 1205 Gimbel Building, Philadelphia, Pa.

St. Louis, Established January 18, 1927

President: Harry Scullin. Vice-President: E. D. Campbell. Directors: J. M. Kurn, J. W. Jarboe, A. J. Davis, E. D. Nims, M. E. Singleton, W. F. Carter, J. M. Olin, H. I. Finch. Treasurer: Carter Bliss. Secretary: L. J. Dillon, Southwestern Bell Telephone Building, St. Louis, Mo.

Pittsburgh, Established February 24, 1927

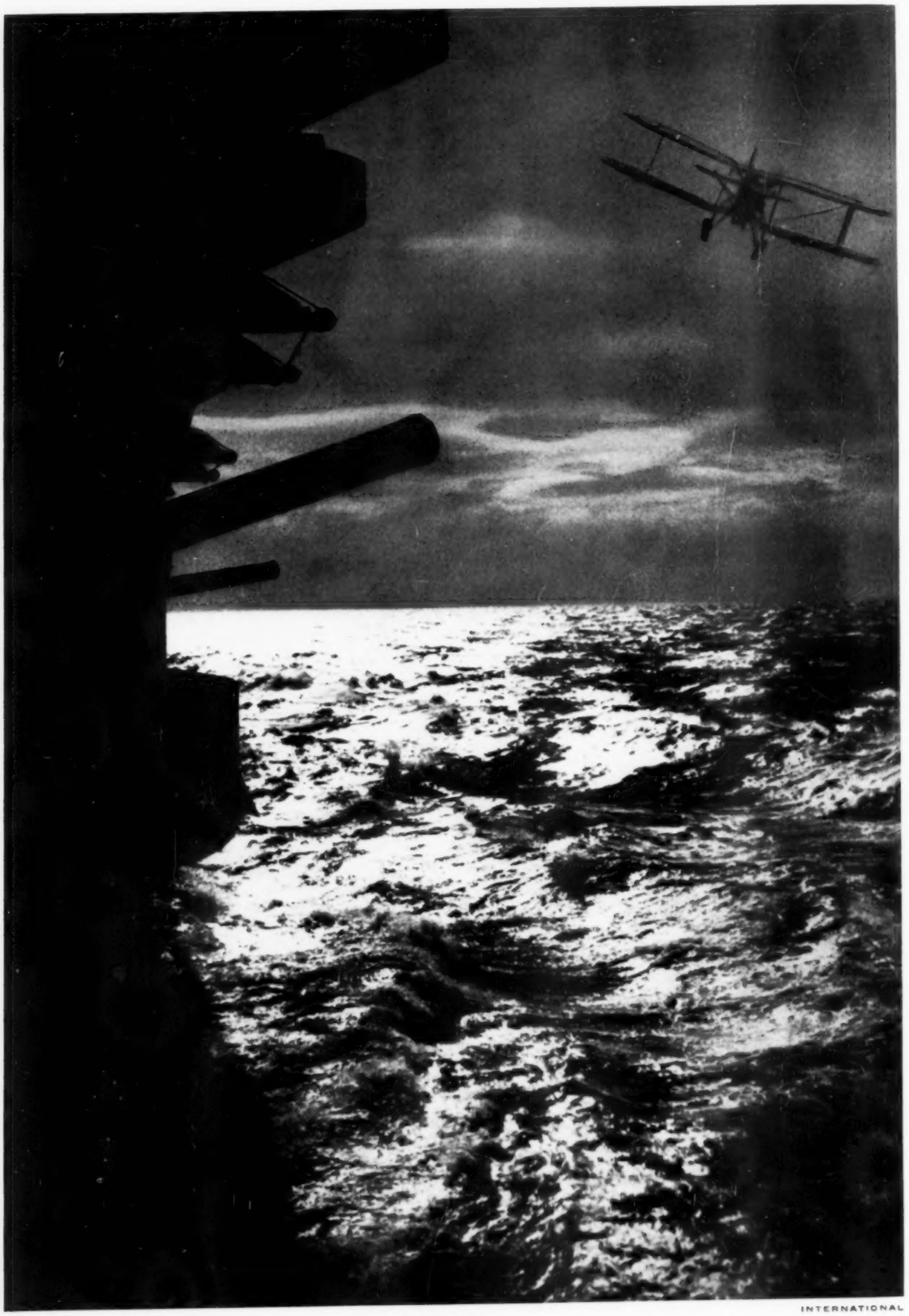
President: Ralph M. Dravo. Vice-Presidents: Taylor Allderdice, George G. Crawford. Directors: O. W. Buenting, Frank B. Bell, H. A. Gidney, C. W. Heppenstall, Julian Kennedy, E. T. Whiter. Treasurer: G. M. Sixsmith. Secretary: W. L. Clay, 1014 Diamond Bank Building, Pittsburgh, Pa.

Milwaukee, Established September 26, 1928

President: W. W. Coleman. Vice-President: Eric H. Lichtenberg. Directors: James G. Cowling, Herbert V. Kohler, Roger Sherman Hoar. Secretary-Treasurer: C. W. Laumann, Bucyrus-Erie Company, So. Milwaukee, Wis.

Birmingham, Ala., Established December 3, 1930

President: Theodore Swann. Vice-President: George Morrow, Jr. Directors: Robert Ingalls, Thomas E. Kilby, S. F. Clabaugh, George Woodruff, C. H. Menger, Herbert Stockham, Landers Sevier. Treasurer: Ralph E. Parker. Secretary: J. D. McIntyre, 250 Federal Building, Birmingham, Ala.



INTERNATIONAL

DAWN PATROL

ARMY ORDNANCE

Vol. XIV NOVEMBER-DECEMBER, 1933 No. 81

Cavalry "Marches" on Wheels

A Description of the Big Bend Portée

By Henry Cabot Lodge, Jr.*

IN one of his recent military works Capt. B. H. Liddell Hart dismisses cavalry as we have known it by "assessing the issue mathematically"—to use his own neat phrase. He then asks this question: "Which is quicker—to travel nine and three-quarter miles on a horse and a quarter of a mile on foot, or to travel nine and a-half miles in a swift machine and half a mile on foot?" The answer, he says, "is unmistakable and the conclusion surely unanswerable."

To one who is both a layman and an easterner and whose scant store of military knowledge is all too often derived from books, the answer indeed seems unmistakable—unless the layman happens also to be a reserve officer who had the good fortune to serve a tour of active duty on the Mexican border. Being the layman in question, one of my first impressions on reaching Fort Bliss last August was that nine miles was a distance hardly to be considered in the Rio Grande country and that the number of miles where no machine could be "swift" for great distances was to be measured not in tens but in hundreds. It seemed to me then that Captain Liddell Hart was making the issue too simple and that the choice was not limited to motoring and walking on the one hand and to riding and walking on the other. Use of the three methods of locomotion did not seem inconsistent with the manifold varieties of terrain over which an army must pass. Moreover, it was evident that the Regular Army, far from excluding the idea that it was practical to combine all three, was about to give the idea an exhaustive service test on a scale larger than had ever been attempted heretofore.

FOR it was my privilege to arrive the day before the 1st squadron of the 7th Cavalry was to set out on its motorized march into the Big Bend of Texas, that vast loop of land stretching roughly from Presidio on the west to a point north of Boquillas on the east. For about six months preparations for this march had been in the making. Under the direct supervision of Lieut. Duval C. Watkins, Q. M. C., with the expert engineering advice of Maj. John H. Woodberry, Ord. Dept., a fleet of twenty-three trailers had been made and a set of ancient Class B trucks to haul them had been rejuvenated. With this capable supervision and acting on the impetus which Brig. Gen. Walter C. Short had for years been giving to the idea, results were achieved entirely by soldier labor which, if not actually prodigious, were certainly astonishing.

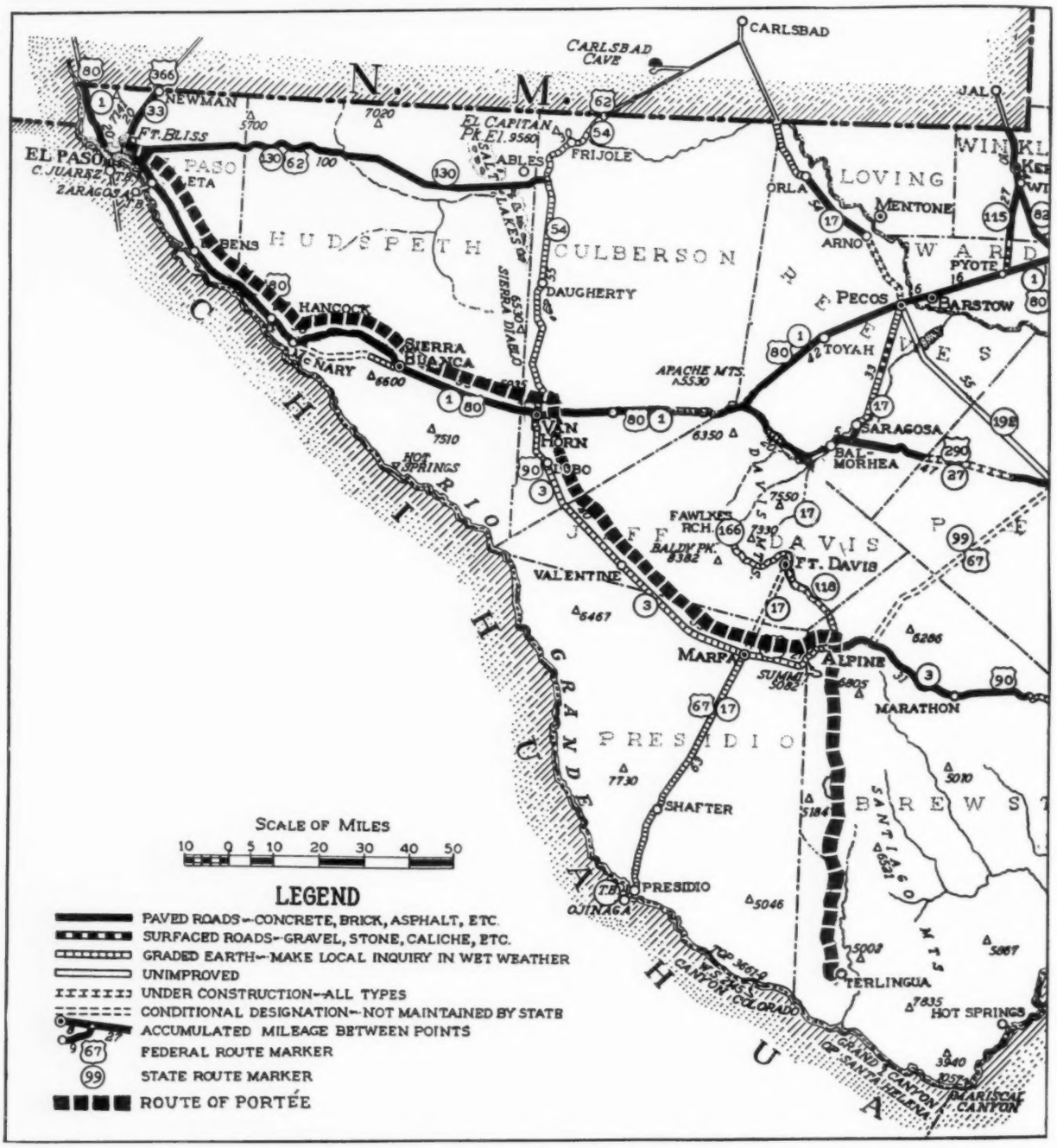
The trailers, which to the cavalryman were the most interesting of the vehicles, were twelve yards long and thirteen feet high. Each one contained eight horses which stood parallel with the axles. On one side the wall of the trailer rose perpendicularly. On the other it rose to a point just below the overhang of the animal's neck and at this point a metal framework about one and one-half feet wide was attached on which light canvas mangers were mounted. The sides were of metal sheeting up to the level of the horses' backs. From there to the canvas ceiling was closely meshed wire netting. This avoided any danger of a horse attempting to jump out and seemed to give the animal a sense of security.

Running the length of the inside of the trailer on a line with the mangers was a piece of steel piping to which the horses' halters were attached. Fixed to this piping and running across the breadth of the trailer were wooden boards which were inserted after each horse had taken his place, so as to prevent the animals from piling up on each other when the trailer was at an angle. The door was at the rear, hinged at the floor of the trailer. When it opened it formed a ramp on which the horses were walked in and out. The trailer was mounted on four wheels and consisted in large part of old parts which had been left over from the war.

THE trucks were of similar war-time vintage, being powered with old four-cylinder Liberty motors. Their maximum speed was in the neighborhood of fifteen miles an hour. In addition to these twenty-three trailer units there were fourteen other vehicles, including the new Ordnance 75-mm. motorized field piece, which, contrary to tradition, was capable of a greater speed than the main body of cavalry and had to proceed in second speed at various times on the march while the main body was in high gear. Noteworthy too were the rolling kitchens, using gasoline as fuel, which prepared meals while the column was on the road. One mess sergeant, who cooked forty-two succulent pies while the column was climbing and descending a steep mountain full of hairpin curves, remarked that he could cook everything in these kitchens that could be cooked at the Ritz—with the single exception of cake. For this delicacy there was too much vibration! Noteworthy in a different way were the war-time F. W. D. water and gasoline supply trucks with their solid rubber tires.

Other components of the column, which played important parts, were the motor ambulance and the engineers truck. Most miraculous of all, perhaps, to the lay eye, was the radio installation which operated on three networks, one covering a ten-mile radius and embracing the head and tail of the column and the command car—an ancient Cadillac in which rode Maj. J. A. Robenson, Cavalry, commanding officer of the expedition, a chauffeur, a radio operator and the squadron

*First Lieutenant, Cav. Res., State Representative, Massachusetts. Writer on military, naval and colonial questions for *N. Y. Herald Tribune*, 1927-1931. Author "The Cult of Weakness" (1932), a study of public opinion in relation to the national defense. Member, Naval Historical Foundation.



Portion of the Map of Texas Showing the Route of the Portée—From El Paso to Alpine to Terlingua and Return, a Distance of 616 Miles.

adjutant. When in "close order" with a 150-yard interval between vehicles—which was seldom the case on the trip—the column covered one and a-half miles of road. Without radio it is hard to see how Major Robenson could have exercised command.

For information on conditions thirty to forty miles ahead the column depended on the squadron of four armored cars commanded by Capt. John Macdonald which, with their fast and satisfactory Marmon-Herrington supply trucks, could easily keep that distance ahead of the main body. Captain Macdonald's command car also had a sending and receiving set and he was a link in a second radio circuit with its sixty-mile radius which included the command car of the main body and Fort Bliss. These two networks were constantly used with all vehicles in motion. A third network, which was not used with as much frequency, made possible voice communication between the armored cars, the airplane overhead and Fort Bliss.

The column carried enough forage and rations to feed its 200 odd officers and men and its 170 horses for ten days. The troopers, with their equipment and forage, rode eight to a truck. Where fire power was concerned, the column seemed formidable. I have already mentioned the motorized 75-mm. gun. In addition each man was equipped with rifle and pistol, there were nineteen machine guns of caliber .30, four of caliber .50 and twelve Thompson sub-machine guns.

A HALT ON THE HIGHWAY FOR LUNCH.

PULLING LONG GRADE BETWEEN ALPINE AND TERLINGUA.

Ammunition was not carried to the maximum extent possible in case of war.

So much for the personnel and equipment. What was their performance? Stated briefly, they left Fort Bliss soon after dawn bound for the Big Bend, drove more than twenty-four consecutive hours on the first "leg" of the trip, traversed almost 170 miles of country which by civilian standards could properly be described as roadless and returned to Fort Bliss ten days later having travelled a total of about 616 miles. All this was done without serious injury to man, beast or machine and the column reached its destination at least twice as rapidly as would have been the case with the old-fashioned horse column.

THIS, of course, is the barest and most statistical statement of the case. The first "leg" from Fort Bliss to Marfa was the longest and the third "leg," from Alpine to Terlingua was the most difficult. Terlingua, a diminutive mining settlement in the deepest dip of the Big Bend and about fifteen miles from the international boundary, was the destination of the column. Alpine is situated on the northern side of "Big Hill" and a drive up one side of this mountain and down the other would be a sufficiently hair-raising experience for one day in the life of the average motorist. But it was but a prelude to conditions which were far worse. The Big Bend country, apart from looking like a bit out of Dante's Inferno, is both arid and uneven in the extreme. It has a reputation among the natives of maintaining 115 degrees of heat throughout the summer. There seldom is rain, but when it comes it tears enormous gashes in the surface of the land which are cut perpendicularly down into the ground. The occasional trucks running in and out of the mine at Terlingua had rounded the edges of these cuts, but had done little more. By simply piling stones, trails up the steep sides of canyons had been made wide enough for a light car. The turns were many and abrupt. The grades in the gullies were as steep as twenty per cent. There were very few bridges and one of these had to be shored up—a seemingly complicated performance which was capably done in slightly more than an hour by the engineering detachment under the command of 1st Lieut. Clifton T. Hunt, C. E.

On the entire march 10,303 gallons of fuel were consumed, so that the column only averaged about 1.7 miles per gallon. Costly as this may seem, it should be borne in mind that if the expedition establishes the value of portée cavalry, certain Army posts can be abandoned with a saving to the taxpayer far greater than this gasoline cost. From a war-time standpoint, it is superfluous to remark that almost any improvement which increases efficiency is good economy.

Judged by ordinary civilian motoring standards the speed of the column was low. The average on the way to Terlingua was seven miles an hour. The average on the way back to Fort Bliss was ten. This very striking improvement could not be accounted for by the terrain or by any mechanical changes. It appeared instead to be due to the increase in the skill of the drivers. The task of driving one of the 30,000-lb. truck and trailer units was not simple. The turning of the steering wheel and the frequent shifting of gears required real muscular effort. There was the inevitable stiffness from sitting upright in a relatively cramped position for hours on end. Most trying of all, perhaps, was the mental strain created by the difficult road conditions, both as to grades and to turns, which, in the case of these long eight wheeled units, involved appraisals of a far different character from those which are demanded from a private citizen in his touring car. The drivers had relief, of course, but it is perhaps

THE HORSE TRAILER.

Capacity: 8 horses; length: 235 inches; height: 126 inches; width: 104 inches; wheelbase: 135 inches; gross weight: 17,000 pounds.

fair to say that very few of them received adequate sleep.

Standing for several hours at various difficult points along the line of march, I realized that there are many details which increase the efficiency of a truck when driven for long distances. On the way out of Fort Bliss, for example, many of

Unloading—Eight Horses are Carried in the Trailer.

the trucks had difficulties with dips in the road which they scarcely noticed on the return. Coming to a peak in the road they would find themselves in first gear and seeing another rise in the ground just ahead, they would tend to stay in first gear on the downward slope. Later they learned to coast down every slope where road conditions were safe and thus gather enough momentum to carry them up the next rise without difficulty.

It is, of course, probable that with modern trucks and trailers the average speed would have been tripled. But even these old machines made the trip without important casualties. There were, I believe, no flat tires at all, although a stone got wedged in between a pair of dual tires and had to be chipped out with a chisel. Evidently the pneumatic rubber was squeezing it on all sides and would not relax its grip. There were minor difficulties with ignition and clogged gas lines and the most serious damages occurred to the links which fastened truck and trailer together. Going through the arroyos of the Big Bend the truck and trailer would be each pointing in separate directions and riding at differing angles, due to the fact that sharp rises and sharp twists were combined. Coming through this kind of terrain at night, the driver would sometimes apply the brakes with force. The trailer would then start to sheer off to the side or coast in to the truck, with the result that the connecting mechanism was not infrequently broken. The travelling machine shop, however, made all repairs.

Another misadventure which had something of the spectacular occurred in one of these arroyos when the piece of piping to which the horses' halters were attached sheered off and fell to the floor of one of the trailers. The transverse boards which kept the horses separate also fell to the floor with the result that there were eight kicking horses apparently hopeless scrambled up inside their metal cage. The door at the rear was opened and most of them got out that way. One of the animals, however, succeeded in forcing his head, neck and forelegs out through the frame holding the mangers—which was about one and a-half feet wide. Here he stuck until Major Robenson helped him to insert his hind legs in this narrow opening. He landed with his face on the ground, but galloped cheerfully away and soon resumed his position.

This animal had a scratch on his face. The total of injured animals was three out of a total of about 170. Only two of these could be directly ascribed to the trailers and no animal was at all seriously injured. In fact, it was striking to see how soon the horses adapted themselves to the travelling stables. They were, from time to time, led out when the grades were very steep and long. On these occasions they were pushing their noses up against the trailers in their anxiety to reënter. When the column arrived at Terlingua the squadron mounted up and rode the fifteen miles to the Rio Grande and back. When they mounted up the horses were as fresh as though they had been in stables. It is not hard to contrast this with the condition of the horses if they had marched the entire distance unaided.

What was true of beast was just as true of man. Those who had driven in armored cars or modified touring cars where it was impossible to lie down, and those who drove the trucks were sleepy and stiff when they reached Terlingua. But the main body travelled eight to a truck. The hay for their eight mounts was in the truck and there was ample room for sleep. They either slept or reclined most of the time and I doubt whether a fresher lot of men ever came upon the scene of action. One of the main purposes of military science, as Maj. Gen. C. C. Williams, for example, has often impressed upon me, is to get the soldier to the point where you want him to fight in a condition where he can fight to his utmost. It is for this purpose that he is clothed, fed, boarded and paid. The march to the Big Bend certainly fulfilled that main purpose. Here was no frittering away of energy in long hot marches with burdensome packs, insufficient food and drink and occasional snatches of sleep. It is perhaps conceivable that days and nights of ceaseless motoring will create so-called "occupational" ailments. It would not be surprising if the men who have to sit upright in an automobile seat for days on end became subject to constipation. But the health report on the Big Bend march showed only the usual minor digestive upsets which always accompany the sudden transition to field conditions.

As this was an initial service test it is natural that all sorts of opportunities for mechanical improvements should come

The 75-mm. Truck Mount with the Squadron.

to light. The connecting mechanism between truck and trailer should be strengthened; the armored car radio sets could well be more powerful; and something should be devised to enable the 75-mm. to carry more ammunition. These improvements and several others like them seemed

plain to those who were with the convoy. There seemed also reason to believe that the convoy was too large for one man to handle efficiently, in spite of the aid given by the radio. Besides these and similar improvements it was apparent that the Class B truck, which was the principal mainstay of the convoy, was neither fast enough nor sufficiently powerful for the mission assigned to it. On one occasion these trucks had to be boosted by others. Certainly modern vehicles would have increased the speed and dependability of the convoy.

OF course, this raises the question as to whether the old, patched-up equipment which was used was not, after all, more realistic if war-time conditions are kept first in mind. One wondered whether the finest equipment would not soon become uncertain under the stress of actual warfare. One could not resist the notion that the ideal motorized soldier is a man who can take a lop-sided assortment of junk into the field, make it run and keep it going. From this standpoint the convoy gave one a clearer insight into war conditions than if all the equipment had been fresh from the factory.

The commanding officer's conclusions with regard to the march were:

"that the idea of transporting a fighting force of the size of a squadron of cavalry (with added firepower) by motor is feasible and highly desirable;

"that the efficient radius of operation for such a motor convoy is from three to four hundred miles, depending on the type of motor used in the trucks;

"that with such a convoy available at central stations, the border could be more efficiently patrolled and protected and at the same time eliminate the necessity for smaller intermediary posts."

One may justly concur with these conclusions, both in what they assert—and in what they omit. Certainly portée cavalry is "highly desirable" and it proved itself "feasible" under the conditions prevailing in southwestern Texas in the first half of August, 1933. In other words, the personnel and equipment of the convoy proved that it could carry out its mission in spite of heat, dust and uneven terrain. But there was no rain with which to contend and a really heavy downpour, according to the inhabitants, would have transformed parts of the line of march into veritable seas of mud. It may be correctly argued that the chances are in favor of dry weather in the southwest and that the value of motorized cavalry under Mexican conditions should not be seriously questioned on that ground. But how about warfare in other regions? We have yet to see what kind of a showing such a convoy would make in snow and ice. Moreover, when we think of other regions, we think of large units. The squadron of cavalry which went to the Big Bend occupied on the average five miles of road. Would not a regiment, at the very least, occupy ten? And could one very well expect a peace strength cavalry division to occupy less than thirty miles?

These are some of the questions which must come to the mind of an ignorant, but interested, layman. There are others. When the convoy crossed the "Big Hill," just south of Alpine, all traffic at either end of the mile and a-quarter mountain road had to be blocked. The road had to become a one-way street. Even if the column were moving in its closest order—which would be difficult on a steep hill—this condition would tend to cause congestion. The Big Bend convoy, of course, was a one-way affair. War conditions would require traffic moving in both directions. Would not even a brief one-way stretch be a serious bottle-neck, both causing delay and affording a fine target for enemy fire?

There is also the lesson which military history has taught me—that war is a primitive and elemental way of reaching results and that the most highly developed terrain is soon shorn of the attributes of civilization and reduced to a condition more rugged and difficult for human use than it was in its original state of nature. If this assumption is correct we could not count on the continued presence either of sewers, telephone and telegraph lines or of filling stations, machine shops—and practicable roads. There are, of course, cross-country fighting vehicles. But a cross-country vehicle for the transportation of large numbers of men, animals and supplies is another matter. If we assume that in future war we must conduct a large part of our operations in a wilderness, we must hope for the development of such vehicle.

Finally the development of thoroughly competent cross-country vehicles will not avail if they cannot be serviced. If enemy airplanes and artillery have created a wilderness of great extent, it may often be difficult to service the vehicles without withdrawing them far from the area where they are of highest combat value. As one who took part in the Sacremento mountain cavalry maneuvers in 1931, I feel secure in my belief that even in time of peace there are still areas where only legs, be they animal or human, can cover the ground. I wonder whether in time of war this area would not be very widely enlarged. Captain Liddell Hart may assert that in future wars we will "travel nine and a-half miles in a swift machine and half a mile on foot," but a small, still voice whispers to me that I should be prepared to walk or ride that last ten miles—and consider myself fortunate if that is all the walking or riding that I would have to do!

OF course nothing can belittle the accomplishments of those who took part in the Big Bend convoy. Indeed no one who accompanied the convoy could have other than high praise for the way in which the march was conducted. Maybe further tours of active duty with the Regular Army will accustom me to the intelligence, forethought and fine spirit which is displayed at times when the average man can think of only two things—something to eat and a place to lay his weary bones. But, although I have probably been more closely associated with the Regular Army in peace-time than is the privilege of most civilians, I am always thrilled by the splendid appearance, good discipline and purposeful initiative which is shown when sleep, food and drink have been wanting and a loss of temper would be the expected result.

Indeed, the random thoughts which I have expressed on the limitations of motorized cavalry but serve to emphasize the enormity of the problem in which the men of the Big Bend convoy are among the pioneers and to the solution of which they have already made important contributions. We can add up our reservations, as I have just done, and undoubtedly the many who are far better informed than I will think of many others. Yet I believe that nothing will alter the conclusion that the Big Bend convoy was pure gain. The motorization of cavalry may not be all that its most enthusiastic sponsors claim it to be, but it certainly will eliminate substantial parts of the long marches through zones relatively untouched by war's destruction. It will thus reduce the numerous physical discomforts and sufferings which in the past have brought man and beast into action in a condition of subnormal efficiency. There will always be enough weariness in war—of that we may be sure. Practical steps taken to reduce it will bring victory that much closer.

Proof Tests and Proof Marks

I: Small Arms Practice of the British Companies

By Calvin Goddard*

CONCERNING proof tests and proof markings as applied to small arms, the average ordnance officer or arms enthusiast knows all too little. And while this series of articles makes no pretense of treating the matter exhaustively, the author nevertheless feels that it will supply much data not readily available elsewhere. He therefore offers it to readers of Army Ordnance in the hope that it may, for some of them, clarify certain questions upon which they have heretofore been unable to secure authoritative information.

Confining our studies for the moment to English-speaking countries, we find that the proving of arms in Great Britain dates from 1637, on March 14 of which year, the "Master Wardens and Society of the Mystery of Gunmakers of the City of London" (later known as the "Gunmakers' Company") was granted a royal charter. The reasons for the organization of such a group may be deduced from a perusal of this document, which says, in substance—"That divers blacksmiths and others unexpert in the art of gunmaking had taken upon them to make, try, and prove guns after their unskillful way, whereby the trade was not only much damnified, but much harm and danger through such unskillfulness had happened to His Majesty's subjects."

It is evident that the charter was designed to remedy such abuses. The powers it conferred were wide, in that it permitted the Gunmakers' Company to "search for and prove all manner of hand guns, great and small, daggs and pistols, and every part thereof, whether made in London or the suburbs, or within ten miles thereof, or imported from foreign parts, or otherwise brought thither for sale." Various standards to be followed in proving of sundry types were thereupon established, and in a second charter granted the Company in 1672, it was empowered to enforce the proving of all arms then in use in England.

Now the "proving" of a weapon involves the firing from it of certain established charges of powder and ball (or shot), both of these in excess of those normally employed, in order to determine whether it is soundly made and capable of withstanding the punishment attendant upon firing with such overloads. It is commonly conducted in two stages, the first involving the barrel alone, and known as "provisional" proof, while the next follows after barrel and action have been assembled and the arm is ready for use, save for minor finishing operations. This last is known as "definitive" proof.

In each instance the barrel, provided it passes the test without developing evidence of weakness, is stamped with a mark indicating its acceptance. After the second trial, the action receives a similar mark. The stampings vary according as the arm is a shot gun, rifle, pistol, revolver, etc., different types of weapons having been grouped into ten classifications according to the British proof regulations adopted in 1925.

Obviously, the number of classes listed has increased along with advances in cartridge manufacture and small arms engineering. Thus, when Greener published his 1881 edition of "The Gun and Its Development," there were but five, plus one subclassification (added in 1875), this last applying to choke-bored shotguns. Choke boring was then of recent introduction, and was responsible for the departure from the longstanding custom of proving barrels with solid leaden slugs. In the case of weapons of this new class, a charge of shot was used for the proof test, a bore-diameter ball being too large to pass through the choked portion of the tube. At present, shot charges have entirely supplanted the solid bullet for the proof of smooth-bored British weapons.

In the early 90's, smokeless powder began to come into wide use. As a result, an optional "Nitro Proof" was introduced in 1896. After the lapse of another ten years, this had become practically a routine measure, and thenceforward all arms subjected to the "nitro" proof received additional stampings indicating this.

SINCE 1925, guns nitro-proved receive stampings which are in effect combinations of the former definitive and nitro-proof marks, and in addition the bore diameter, and length of cartridge case for which adapted, appears on each barrel. Thus the period of manufacture of a British-made shotgun (i. e. before or after 1925) may be determined by the presence or absence of die marks indicating the length of the cartridge case.

As may be seen by consulting Table A (page 141) [this is known as "Scale No. 4 for the proof of Arms of the Fourth Class (Breech Loading Arms of Smooth Bore) in the 1925 Proof Regulations"] the amount of powder employed in the present-day provisional proof is approximately three times the service charge, while the weight of the shot about equals that used in the field. In the definitive proof, the charge of powder is approximately twice that (by weight) of a service black powder charge, while the shot charge exceeds the standard load by about 50 per cent.

In column two of Table A we find certain gauge designations recorded in the form of improper fractions. These are included among the markings now imprinted upon shotgun barrels of British make, according to the actual bore diameter of the arm under test, as indicated in column three of the table.

For the purposes of the proof tests, in gauges between 4 and 10, each size is divided into three parts, according to the actual bore diameter of the arm, while in gauges from 11 to 17, but two divisions per gauge exist. In the first group, the subclassifications under a given gauge are indicated in triple groupings, such as: $4; \frac{4}{1}; \frac{4}{2}$ while in the second they appear listed doubly, as $12; \frac{12.}{1.}$ Thus (consult column 3, Table A) guns of 12 gauge falling into subclass 12 are all those having a bore diameter of .729 to .739, while those in class $\frac{12}{1}$ will run from .740 to .750. If .751 or above, a gun automatically falls into the 11 gauge category, and is proved as such. (The gauge size is estimated nine inches forward of the breech.)

*Managing Director, Scientific Crime Detection Laboratory and Professor of Police Science, Northwestern University School of Law, Chicago, Ill. Lieutenant Colonel, Ordnance Reserve, U. S. Army.

TABLE A—SCALE No. 4

FOR THE PROOF OF ARMS OF THE FOURTH CLASS—BREECH-LOADING ARMS OF SMOOTH BORE—(*See Rules 10, 14, 30, 51 and 52*)

Nominal Size of Cartridge.	Gauge as marked at Proof.	Diameter of Bore.	Provisional Proof.				Nominal Length of Chamber.	Definitive Proof.				Service Charge.			
			Powder, T.P.		Shot.			Powder, T.S.P.		Shot.		Black Powder or Equivalent.		Shot.	
			grains.	drs.	grains.	oz.		grains.	drs.	grains.	oz.	grains.	drs.	grains.	oz.
	5/2	1·026													
	5/1	1·001	740	27			4″								
	5	·976													
4	6/2	·957			1421	3¼	4¼″	492	18	2050	4 11/16	246	9	1530	3½
	6/1	**·938**	649	23¾											
	6	·919													
	7/2	·903													
	7/1	·888	567	20¾			3¼″								
	7	·873					3½″	328	12	1367	3⅛	164	6	930	2⅛
	8/2	·860													
8	8/1	·847	492	18	984	2¼	3¾″	382	14	1613	3 11/16	191	7	1093	2½
	8	**·835**													
	9/2	·824					4″								
	9/1	·813	417	15¼			4¼″	436	16	1832	4 3/16	218	8	1203	2¾
	9	·803													
	10/2	·793					2⅝″	218	8	936	2⅛	95	3½	601	1⅜
	10/1	·784	348	12¾											
10	**10**	**·775**			711	1⅝	2¾″	232	8½	984	2¼	109	4	656	1½
	11/1	·763	294	10 ¾			2⅞″ 3″	260	9½	1094	2½	123	4½	765	1¾
	11	·751					3¼″								
	12/1	·740	266	9¾			2½″ 2⅝″	178	6½	738	1 11/16	82	3	492	1⅛
12	**12**	**·729**													
	13/1	·719	260	9½	547	1¼	2¾″ 2⅞″	206	7½	875	2	92	3⅜	547	1¼
	13	·710					3″	226	8¼	957	2 3/16	102	3¾	656	1½
	14/1	·701					3¼″								
14	**14**	**·693**	246	9											
	15/1	·685	239	8¾	492	1⅛	2½″	164	6	685	1 9/16	80	2⅞	465	1 1/16
	15	·677					2¾″	191	7	793	1 13/16	85	3⅛	520	1 3/16
	16/1	·669	226	8¼											
	16	**·662**					2½″	154	5⅝	656	1½	75	2¾	437	1
16	17/1	·655	218	8	437	1									
	17	·649					2¾″ 3″	178	6½	738	1 13/16	82	3	492	1⅛
	18	·637	211	7¾											
	19	·626	205	7½			2½″	136	5	574	1 5/16	65	2⅜	383	⅞
20	**20**	**·615**			383	⅞									
	21	·605	198	7¼			2¾″ 3″	157	5¾	657	1½	75	2¾	437	1
	22	·596													
	23	·587	191	7											
24	**24**	**·579**	184	6¾	355	13/16	2½″	123	4½	520	1 3/16	58	2⅛	328	¾
	25	·571													
	26	·563	178	6½			2¾″	140	5⅛	575	1 5/16	65	2⅜	383	⅞
	27	·556	171	6¼			2½″	113	4⅛	465	1 1/16	52	1⅞	273	⅝
28	**28**	**·550**	164	6	328	¾									
	29	·543	150	5½			2¾″	130	4¾	547	1¼	58	2⅛	328	¾
	30	·537	144	5¼											
	31	·531													
	32	·526	137	5											
	33	·520					2½″	95	3½	410	15/16	41	1½	246	9/16
32	34	·515			246	9/16									
	35	·510	130	4¾			2¾″	109	4	465	1 1/16	48	1¾	300	11/16
	36	·506													
	37	**·501**	123	4½											
	38	·497													
	·410	**·410**					2″	55	2	219	½	23	⅞	137	5/16
.410	to	to	78	2½	219	½	2½″	65	2⅜	273	⅝	27	1	191	7/16
	·415	·415													
.360	**·360**	**·360**	41	1½	82	3/16	1¼″	34	1¼	137	5/16	13½	½	82	3/16

NOTE.—The Gauges and Diameters in Bold Type are those to which barrels are usually bored for Definitive Proof for use with the Cartridges belonging to the groups in which they are included.

WHILE London was, in 1637, no doubt the hub of the British arms industry, Birmingham eventually came prominently into this field, so much so that in 1813 an Act of Parliament authorized the establishment there of a laboratory or "proof house" where arms could be tested, thus saving the expense of shipment to London and return. For several decades, however, the character of the tests applied at Birmingham differed from those in use in London, being less severe, with the result that the Birmingham proof fell somewhat into disrepute. In 1868, however, another act requiring the same order of trials at both places was passed and since then they have not differed in any respect. The proof marks employed are unlike, however, the Gunmakers' Company (London) and the "Guardians" (Birmingham), having distinctive sets of dies for this purpose. The rules of proof now current in these two cities, the stampings applied to arms meeting these, and the conditions under which they are affixed, are as follows: (reprinted from "Rules, Regulations and Scales Applicable to the Proof of Small Arms," London: 1925):

Schedule B

Classification of Small Arms

FIRST CLASS—Single-barrelled muzzle-loading arms of smooth bore.

Second Class—Double-barrelled muzzle-loading arms of smooth bore.

Third Class—Muzzle-loading rifled arms.

Fourth Class—Breech-loading arms of smooth bore.

Fifth Class—Breech-loading rifled arms, including express rifles, declared for use with black powder only.

Sixth Class—Breech-loading rifles, declared for use with nitro powders, not being of the seventh, eighth and tenth classes.

Seventh Class—Breech-loading rifled arms chambered to take a military small-arm cartridge, and not being of the tenth class.

Eighth Class—Breech-loading rifled arms especially constructed for use with shot and bullet, having the whole, or a portion only, of their bore rifled, and not being of the fifth class.

Ninth Class—Revolving arms and repeating and automatic pistols.

Tenth Class—Breech-loading rifled military arms.

Definitions of Kinds of Proof.—1. There shall be two kinds of compulsory proof, viz. (except where one proof is specifically provided for): provisional and definitive. There shall also be a voluntary proof. Provisional proof is the first proof applied to barrels which, according to these rules, require two proofs. Definitive proof is that applied as the second proof to barrels which require two proofs, also that applied to those which require one proof only under Rule 6. Voluntary proof is an additional one applied after the definitive proof, according to Rule 18.

Powders Used in Proof.—2. The descriptions of powder used in proof shall, except as provided in Rule 18, be as follows:

That known as "Tower Proof," or "T. P.," which shall be of strength equal to Waltham Abbey "R. F. G. 2," and of a grain varying between Nos. 4 and 5; that known as Curtis's and Harvey's "T. S. P."; that known as Curtis's and Harvey's "T. S. No. 2": that known as Colonel Hawker's "Duck Gun Powder"; and the nitro powder known as "Cordite," or any other description of nitro powder which may hereafter, from time to time, be adopted by His Majesty's War Department.

Provided, nevertheless, that, if any of the powders for the use of which this rule provides, should be considered by the Two Companies unsuitable for the proof of any particular description of barrel, they shall have power to adopt such other powder as they may consider to be most suitable, having first obtained the approval of His Majesty's principal Secretary of State for the War Department.

Shot.—3. The shot used in proof shall be that known as "Soft Shot," size number 6.

Bullets.—4. The bullets used in proof shall be of pure lead, except as provided in rules 12, 13, 15, 16 and 25, and of such forms as are hereinafter defined in the rules relating to the proof of the different classes.

Wads.—5. The wads used in proof shall be of felt or other suitable material, and shall not exceed in thickness one diameter of the bore.

Proofs necessary for different classes.—6. Barrels for arms of the first, sixth, seventh, ninth and tenth classes shall be proved once definitively, and for those of the second, third, fourth, and eighth classes, provisionally and definitively, except as provided in Rule 23—provided, nevertheless, that barrels for arms of the second and third classes, sent in a state for definitive proof, may, at the request in writing of the sender, be proved once only according to the scale for Provisional Proof.

Proof of single muzzle-loading barrels of smooth bore.—7. Barrels for arms of the first class shall be proved with T. P. powder and shot, according to Scale No. 1, and shall be marked as herein provided in Rule 38.

Proof of double muzzle-loading barrels of smooth bore.—8. Barrels for arms of the second class shall be provisionally and definitively proved with T. P. powder and shot, according to Scale No. 2, and marked as herein provided in Rules 37 and 38, or may be proved once only, as provided in Rule 6, and marked as herein provided in Rule 38.

Proof of muzzle-loading rifles.—9. Barrels for arms of the third class shall be provisionally and definitively proved with T. P. powder and a cylindrical flat-ended bullet, according to Scale No. 3 and marked as herein provided in Rules 37 and 38, or may be proved once only, as provided in Rule 6, and marked as herein provided in Rule 38.

Proof of breech-loading shot barrels.—10. Barrels for arms of the fourth class shall be provisionally proved with T. P. powder and shot and definitively proved with T. S. P. powder and shot to cover the use of nitro powders according to Scale No. 4. Automatic and repeating guns may be fired with the number of shots the magazine will contain. Barrels proved under this rule shall be marked as herein provided in Rules 37, 38, 40 and 58.

PROOF of Breech-loading rifles Class 5.—11. Barrels of arms of the fifth class may be provisionally proved with T. P. powder and a cylindrical flat-ended bullet. They shall be definitively proved with T. P. powder and a cylindrical flat-ended, or cylindro-conoidal bullet, according to Scale No. 3 and shall be marked as herein provided in Rules 38 and 54. Provided, nevertheless, that, should a barrel be chambered for a cartridge which cannot contain the service charge defined in the scale, it may receive a special definitive proof with a charge based upon the maximum service charge of such cartridge. Provided also that, should a barrel be intended to be used with a larger charge than the service charge defined in the scale, the sender shall declare the same in writing, and

a special definitive proof based upon such declared service charge which the Two Companies may jointly decide to be suitable shall be applied and shall be marked as herein provided in Rules 38 and 54.

Express rifles of this class may be provisionally proved with T. P. powder and a cylindrical flat-ended bullet. They shall be definitively proved with T. S. 2 powder and a cylindrical flat-ended bullet, or such other form as may be, from time to time, considered to be most suitable according to Scale No. 5 and shall be marked as herein provided in Rules 38 and 54, with the addition of the abbreviation "EX" signifying "EXPRESS."

Proof of breech-loading rifles Class 6, with nitro powder.—12. Barrels for arms of the sixth class may be provisionally proved with T. P. powder and a cylindrical flat-ended bullet, according to Scale No. 3. They shall be definitively proved with cordite powder, or such other nitro powder as the Two Companies may, under the provisions of Rule 2, consider to be most suitable, and with a nickel-covered bullet, similar in form to that of the service cartridge for which the barrels are chambered, or of such other material and form as may be, from time to time, considered to be most suitable. The service charge shall be declared in writing by the sender, and the proof charge shall be such as shall give a stress not less than thirty per cent. and not over over forty-five per cent. over that of the service charge or the standard charge, whichever is the greater, as may be readily ascertainable. Automatic and repeating rifles may be fired with the number of shots the magazine will contain. Barrels proved under this rule shall be specially marked as hereinafter provided in Rules 38, 40 and 55.

Proof of Breech-loading rifles, Class 7.—13. Barrels for arms of the Seventh Class may be provisionally proved with T. P. powder and a cylindrical flat-ended bullet, according to Scale No. 3. They shall be definitively proved with cordite powder, or such other nitro powder as the Two Companies may, under the provisions of Rule 2, consider to be most suitable, and a nickel-covered bullet, of a similar form to that of the service cartridge for which the barrels are chambered, or of such other material and form as may be, from time to time, considered to be most suitable. The proof charge shall be such as shall give a stress not less than thirty per cent., and not more than forty-five per cent., over that of the service charge, as may be readily ascertainable. Automatic and repeating rifles may be fired with the number of shots the magazine will contain. Barrels proved under this rule shall be specially marked as hereinafter provided in Rules 38, 40 and 56.

Proof of barrels constructed for shot and ball.—14. Barrels for arms of the Eighth Class shall be provisionally proved with T. P. powder and shot, according to Scale No. 4 for the Fourth Class. They shall be declared in writing by the sender to be of the Eighth Class when presented for definitive proof, and shall be proved with T. S. P. powder according to Scale No. 4, and marked as provided in Rules Nos. 38, 40 and 58. In case barrels are intended to be used with larger charges of powder than the ordinary service charges set forth in the said Scale No. 4, or in which nitro powders are intended to be used with ball, they shall be so declared in writing by the sender, and a proof charge which the Two Companies may jointly decide to be most suitable thereto shall be applied. Barrels proved under this rule shall be specially marked as hereinafter provided for in Rules Nos. 38, 40, 57, 58 and 59.

PROOF of revolvers and repeating pistols.—15. Arms of the Ninth Class shall be proved with a cartridge of the maximum size suitable thereto, and containing such a charge of powder, and such a bullet, as, in the opinion of the Two Companies, will cover the service charge to be used. Revolving arms shall be proved once definitively in each chamber. Repeating or automatic pistols shall be proved definitively, and may be fired with the number of shots the magazine will contain. Arms of the Ninth Class shall be marked as hereinafter provided in Rule 48.

Proof of rifled military arms Class 10.—16. Barrels for arms of the Tenth Class shall be proved once definitively with cordite powder or such other nitro powder as the Two Companies may, under the provisions of Rule 2, consider to be most suitable, and a nickel-covered bullet of a similar form to that of the service cartridge, for which the barrels are chambered, or of such other material and form as may be from time to time considered to be most suitable. The proof charge shall be such as shall give a stress not less than thirty per cent. and not more than forty-five per cent. over that of the service charge as may be readily ascertainable. Automatic rifles and machine guns shall be proved definitively and may be fired with the number of shots the magazine will contain. Barrels proved under this rule shall be specially marked as hereinafter provided in Rule 49.

Proof of breech-loading shot barrels for use with larger cartridges.—17. In case barrels of the Fourth Class are intended to be used with larger charges of nitro powders than ordinary service charges, then the quantities of powder and shot so intended to be used shall be declared in writing by the sender, and a proof charge which the Two Companies may decide to be suitable shall be applied. Barrels proved under this rule shall be marked as hereinafter provided in Rules 40 and 58.

Special proof of breech-loading barrels.—18. Barrels for arms of all classes after having been definitively proved may at the request in writing of the sender (subject to Rule 29) receive a voluntary proof to cover any declared service load, pressure in tons per square inch, kilos per c/m^2, or atmospheres, with a proof charge which the Two Companies may decide to be suitable. Such arms shall be marked with the declared load and, or, the marks "S.P." as hereinafter provided in Rules 41 and 64.

Proof of Government arms.—19. For barrels of all military arms, sent for proof, manufactured for the British or Colonial Governments, the method of proof shall be the same as that employed by His Majesty's War Department.

Length of chambers.—20. The nominal length of cartridge case to be used in barrels of all breech-loading arms shall be declared in writing by the sender, and when deemed desirable by the proof authorities, the nominal length of the case for which the arm has been proved shall be marked in accordance with Rule 52.

Provisional proof of shot barrels larger than 4.—21. Barrels for arms of the Second Class of a larger gauge than 4, for which no charges are laid down in the scales applicable to such classes, shall be provisionally proved according to Scale No. 1 for the First Class.

Definitive proof of shot barrels larger than 4.—22. Barrels for arms of the Second Class of a larger gauge than 4, sent for definitive proof, for which no charges are laid down in the scales applicable to such classes, shall have the service charge declared in writing by the sender, and the proof charge

shall be twice the weight of powder and one and one-third the weight of shot of such service charge. The service charge shall be marked upon the barrels, as provided in Rule 60.

Proof of Punt Guns.—23. Barrels for arms of the First, Second and Fourth Classes of not less than five feet six inches long shall be proved once definitively with Col. Hawker's Duck Gun Powder, and shot. The service charge shall be declared in writing by the sender, and the proof charge shall be twice the weight of powder and one and one-third the weight of shot of such service charge. The service charge shall be marked upon the barrels, as provided in Rule 60.

Declaration necessary for choke-bored barrels, and definition of the same.—24. Barrels for arms of the First, Second, and Fourth Classes which are choke-bored shall be declared to be so, in writing, by the sender when presented for definitive proof. Choke-bored barrels are such as have the diameter of the bore at the muzzle less than at some point behind the muzzle, other than the chamber, or the cone or lead in front of the chamber. Barrels which are choked .004 of an inch may, at the request in writing of the sender, be marked, and those which are choked .008 of an inch shall be marked, when proved, as hereinafter provided in Rule 53. Barrels which are choked .008 of an inch or more, and not marked as provided in Rule 53, are required to be reproved.

Proof of barrels not provided for in classification and scales. 25. A barrel of any description for which the classification and scales of proof do not provide, or to which the said scales are, in the opinion of the Two Companies, inapplicable or unsuitable, shall be proved with such a charge of powder, and a bullet or charge of shot, which the Two Companies may jointly decide to be most suitable for such barrel, and they may, if they think fit, require the service charge to be declared by the sender. In case a barrel shall not be capable of containing such a proof charge, as large a charge as the barrel will contain shall be applied. Barrels proved under this rule shall be marked as hereinafter provided in Rule 61.

Certain cartridge cases to be supplied by sender.—26. Whenever a barrel is sent for proof chambered for a cartridge of unusual size, or of a pattern not in general use, a complete service cartridge and the cartridge cases and bullets required to prove such barrel shall be provided by the sender.

Proof houses not responsible for the proper proof of barrels unaccompanied by necessary requests or declarations.—27. The Two Companies will not be responsible for the proper proof or marking of, and may refuse to prove, barrels which, according to Rules 12, 13, 14, 17, 18, 20, 21, 22, 23 and 24, require special definitive proof, voluntary proof, or special marking, unless such barrels are accompanied by the necessary requests or declarations, defined in the said rules, when presented for proof. Provided always that the Two Companies may prove and mark barrels unaccompanied by any request or declaration in such a manner, as, in their opinion, such barrels should be proved and marked.

PROOF houses may refuse to prove certain barrels.—28. Should a barrel be presented for any special or voluntary proof, which, though it may belong to a class to which such proof may be applicable, is unsuited to such proof, the proof master of the Company to which it is presented may refuse to prove it. He may also refuse to prove a barrel declared to be of a certain class, which is not of such class, except for the class to which it should belong.

Effacing of proof marks.—29. If a barrel, which has already been proved and marked with the definitive proof and view marks, be again presented for definitive or voluntary proof, and shall fail to stand proof, the person or persons, respectively, who is or are entitled to impress the proof and view marks, shall efface the existing marks of definitive and voluntary proof therefrom. Should a barrel which has obviously been weakened after definitive proof be brought to the notice of the proof master of either of the Two Companies, it may be reproved definitively, without the consent of the owner. Should a barrel be brought to the notice of the proof master of either of the Two Companies which is in such a condition that it would be impossible to reprove it, or to properly view it, the marks of definitive and voluntary proof may be effaced therefrom by the beforementioned person or persons.

BARRELS enlarged in bore require reproof.—30. Any barrel which may have been enlarged in the bore after definitive proof, so that the bore mark impressed upon it at proof is not a true representation of the diameter, shall be required to be reproved definitively, and if it shall have received a voluntary proof, it shall be required to be reproved with a voluntary proof; such, for example, as an enlargement from $\frac{9}{2}$ to 8 or $\frac{13}{1}$ to 12, as set forth in Scale No. 4.

Proof powders open to government inspection.—31. The various powders used in proof shall, at all times, be open to the inspection, without notice, of any officer authorized for the purpose by the Secretary of State for War, who may take samples of the same for examination or trial.

Proof of foreign arms.—32. All complete foreign small arms or barrels complete with actions thereof liable to proof under the said Act shall be proved and marked with special proof marks, as provided in Rules 37, 38 and 40, with the addition of the words "not English make."

Reproof of old arms.—32A. All old proved small arms submitted for reproof shall be reproved and marked, in addition to any other proof mark required hereunder or by the said Act, with a special proof mark as hereinafter provided in Rules 41A and 63.

Conditions Precedent to Proof

Single smooth-bored barrels.—33. Barrels for arms of the First Class sent for proof shall be bored and ground, and in a proper state for setting up, with the squares set off, looped, and the proper breeches in, with the thread of the screws sound and full. Barrels for percussioned arms shall be percussioned and have nipples in. Twisted barrels shall be fine bored and struck up.

Other kinds.—34. Barrels for arms of the Second, Third, Fourth, Fifth, Sixth, Seventh and Eighth Classes:

For provisional proof—Barrels of plain metal shall be fine bored and turned or ground, and those of twisted metal shall be struck up in addition. Should plugs be attached, the touch-holes drilled in the plugs must be of a diameter not exceeding one-sixteenth of an inch.

For definitive proof—All barrels shall be struck up and smoothed, the insides shall be clean, the ribs fairly struck up, and such as are muzzle-loading shall have breeches properly percussioned, huts filed up, the proper breeches and nipples attached, with the thread of the screws sound and full. Barrels for rifled arms shall be rifled.

Actions to be attached.—35. Barrels for breech-loading arms shall be definitively and voluntarily proved with the

action attached. The action shall be finished or in the finished-filed state.

Revolving and repeating pistols to be complete.—36. Revolving arms shall have the cylinder or chambers with the revolving action and firing work complete and in working order. Repeating pistols shall be complete and in working order.

37. The marks denoting provisional proof shall be as follows: Provisional Marks, London

As to the Gunmakers' Company: The letters "G P" interlaced in a cypher surmounted by a lion rampant, thus:

On arms of English make. On arms of foreign make.

Followed by the words "Not English Make"

Provisional Mark, Birmingham

As to the Guardians: The letters "B P" interlaced in a cypher surmounted by a crown, thus:

On arms of English make. On arms of foreign make.

Followed by the words "Not English Make"

38. The marks denoting definitive proof shall be as follows:

Definitive Marks, London

As to the Gunmakers' Company: The proof mark, being the letters "G P" interlaced in a cypher surmounted by a crown, and the view mark, being the letter "V" surmounted by a crown, thus:

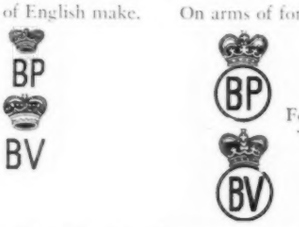
On arms of English make. On arms of foreign make.

Followed by the words "Not English Make"

Definitive Marks, Birmingham

As to the Guardians: The proof mark, being the letters "B P" surmounted by a crown, and the view mark, being the letters "B V" surmounted by a crown, thus:

On arms of English make. On arms of foreign make.



Followed by the words "Not English Make"

39. The marks denoting the special proof of barrels proved according to Rule 16, shall be as follows:

Definitive Marks, Rifles, Class 10, London

As to the Gunmakers' Company: The letters "L M P" interlaced in a cypher surmounted by a lion rampant thus:

On arms of English make. On arms of foreign make.

Followed by the words "Not English Make"

The words "Nitro Proved" to be impressed on the barrel only.

Definitive Marks Rifles, Class 10, Birmingham

As to the Guardians: The letters "B M" surmounted by a crown, thus:

On arms of English make. On arms of foreign make.

Followed by the words "Not English Make"

The words "Nitro Proved" to be impressed on the barrel only.

40. The proof mark applied to barrels proved for use with nitro powders, according to Rules 6, 12, 13, 14, 17 and 18, shall be as follows:

Nitro Proof Mark, London

As to the Gunmakers' Company: The letters "N P" surmounted by an arm dexter in armour, embowered, holding a scimitar, thus:

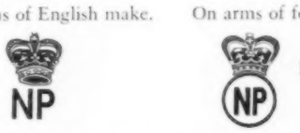
On arms of English make. On arms of foreign make.

Followed by the words "Not English Make"

Nitro Proof Mark, Birmingham

As to the Guardians: The letters "N P" surmounted by a crown, thus:

On arms of English make. On arms of foreign make.



Followed by the words "Not English Make"

41. The marks denoting the special proof according to Rule 18, shall be as follows:

Special Proof Mark, London

As to the Gunmakers' Company: The letters "S P" surmounted by a crown, thus:

Special Proof Mark, Birmingham

As to the Guardians: The letters "S P" surmounted by a crown, thus:

41A. The marks denoting the re-proof of old small arms shall be as follows:

Re-Proved Arms Mark, London

As to the Gunmakers' Company: The letter "R" surmounted by a crown, thus:

Re-Proved Arms Mark, Birmingham

As to the Guardians: The letter "R" surmounted by a crown, thus:

Mode of Affixing Marks

Position of provisional mark.—42. On barrels provisionally proved the provisional proof mark, as set forth in Rule 37, shall be impressed near the breech end.

Position of definitive marks.—43. On barrels for muzzle-loading arms of the First Class, which, according to Rule 6, require definitive proof only, the definitive proof mark and view mark, as set forth in Rule 38, shall be impressed upon the round near the breech end, and if a barrel is constructed with a patent breech the view mark shall be impressed.

44. On barrels for muzzle-loading arms of the Second and Third Classes the definitive proof mark and view mark, as set forth in Rule 38, shall be impressed above the provisional proof mark, and if a barrel is constructed with a patent breech the view mark shall be impressed thereon.

45. On barrels for single breech-loading arms of the Fourth, Fifth, Sixth, Seventh and Eighth Classes, the definitive proof mark and view mark shall be impressed in a convenient position near the provisional proof mark, and the view mark shall be impressed upon the action, body, shoe, breech block, breech bolt or chamber.

46. On barrels for double breech-loading arms of the Fourth, Fifth, Sixth, Seventh, and Eighth Classes the definitive proof mark and view mark shall be impressed upon the flat of each barrel at the breech end, or in a corresponding position when there are no flats, or at the request in writing of the sender, may be impressed upon the round of each barrel, and the view mark shall be impressed upon the action, body, shoe, breech block or blocks, breech bolt or bolts, chamber or chambers, with which the barrels are connected.

Position of mark for one proof only.—47. On barrels for arms of the Second and Third Classes, proved once only, according to Rule 6, the special definitive proof mark, as set forth in Rule 38, shall be impressed in the same position as the view mark occupies according to Rules 44 and 45.

Marking of revolving and repeating pistols.—48. On revolving arms of the Ninth Class the definitive proof mark and view mark shall be impressed upon the barrel and upon the revolving cylinder, and the view mark shall be impressed upon the frame or body of the action. On repeating pistols of the same class the definitive proof mark and view mark shall be impressed upon the barrel, and the view mark shall be impressed upon the action, body, shoe, breech block or blocks, breech bolt or bolts, with which the barrel is connected. When such arms are proved to cover the use of nitro powder they shall bear the additional mark "N P."

49. On barrels of military arms of the Tenth Class the special definitive proof mark, as set forth in Rule 39, shall be impressed upon the barrel, action, bolt or breech block.

Marking of nominal size of bore on all barrels.—50. On barrels for all arms, except those of the Ninth Class, the nominal size of the bore shall be impressed at definitive proof. This may be indicated by the number of balls to the pound, as 12, 16, 20; by decimal parts of an inch, as .577, .450, .303; or by millimetres, as 8-mm., 7-mm., 6.5-mm., as may be most convenient or most suitable.

Subdivision gauges for breech-loading shot barrels.—51. On barrels for arms of the Fourth and Eighth Classes, from 4 to 10 gauge inclusive, the gauges shall be divided into three parts, and the barrels shall be marked accordingly; thus the divisions of 8 gauge would be marked 8, $\frac{8,}{1}$ $\frac{8.}{2}$ From 11 to 17 gauge inclusive, the gauges shall be divided into two parts; thus the divisions of 12 gauge would be 12, $\frac{12;}{1}$ and so on, as provided in Scale No. 4. The gauge size of the barrel shall be taken at a point nine inches from the breech end.

Chamber marks.—52. On barrels for breech-loading arms, the length of cartridge case in inches, shall be impressed following the definitive proof mark, as for example:

4th and 8th Classes. 5th, 6th and 7th Classes.

2½" 360 3¼"; 17= 2(

Choke-bore mark.—53. On barrels for arms of the First, Second, and Fourth Classes, which are choke-bored, the word "Choke" shall be impressed following the definitive proof mark or the chamber mark.

Special definitive marking of rifles, Class 5.—54. On barrels for arms of the Fifth Class, which have received a special definitive proof as provided in Rule 11, the nominal size of the cartridge for which they are chambered shall be impressed near the definitive proof mark, followed by the weight, in grains, of the powder and bullet of the maximum service charge to be used, as for example: "360 14–134."

Definitive marking of rifles, Class 6, proved with nitro powder.—55. On barrels for arms of the Sixth Class, definitively proved according to Rule 12, the nominal size of the cartridge shall be impressed, followed by the special proof mark as set forth in Rule 40, the name of the powder used in proof, or a suitable abbreviation thereof, the weight, in grains, of the powder and bullet of the maximum service charge to be used, and an abbreviation of the word "maximum," as for example: "Cordite 75–480 Max."

Special definitive marking of rifles, Class 7.—56. On barrels for arms of the Seventh Class, definitively proved according to Rule 13, the special proof mark, as set forth in Rule 40, shall be impressed, in addition to the marks of provisional and definitive proof, followed by the words: "Nitro Proved."

Special definitive marking of shot and ball barrels.—57. On barrels for arms of the Eighth Class, definitively proved according to Rule 14, which are rifled through their full length, the letters "S & B," signifying shot and bullet, shall be impressed, following definitive proof mark or chamber mark thus: "S & B."

On barrels which are choke-bored, the word "Choke" preceded by the letter "R," signifying rifled choke, shall be impressed, following the definitive proof mark or chamber mark, thus: "R Choke."

On barrels which have been proved for larger service charges of powder than those set forth in Scale No. 4, the service charges shall be impressed, in drams or grains, as may be considered most suitable, following the above mentioned marks, as for example: "4 Dr. or 109 Gr."

Marking of breechloading shot barrels, and shot and ball barrels for use with nitro powders and shot.—58. On barrels for arms of the Fourth and Eighth Classes, the words "Nitro Proof," with the weight of the maximum service charge of shot to be used, shall be impressed in addition to the existing marks of provisional and definitive proof, as for example: "Nitro Proof 1 1/8."

Supplementary marking of shot and ball barrels, proved with nitro powder.—59. On barrels for arms of the Eighth Class, in which nitro powders are intended to be used with ball, proved under Rule 14, the same marks of proof shall be impressed as for the Sixth Class, followed by the name of

the powder used in proof, or a suitable abbreviation thereof, with the maximum weight, in grains, of powder and bullet of the maximum service charge to be used, and an abbreviation of the word "Maximum," as for example: "CORDITE 32—750 BULLET MAX."

Marking of large bore shot barrels.—60. On barrels proved according to Rules 22 and 23, the service charge shall be impressed in drams and ounces, near the proof and view marks.

Marking of barrels not provided for in rules and scales.—61. Barrels proved according to Rule 25 shall receive such mark or marks, in addition to the proof and view marks, as the Two Companies may consider necessary or most suitable.

Marking of foreign arms.—62. Barrels of foreign small arms or complete barrels and actions thereof, as hereinbefore provided for, in regard to other small arms, or in such manner as the Two Companies may consider most suitable.

Marking of re-proved arms.—63. Barrels of old small arms submitted for re-proof, having marks as hereinbefore provided for in regard to other small arms, shall be marked in such manner as the Two Companies may consider most suitable with the additional proof mark as set forth in Rules 32A and 41A.

64. Barrels of arms which have received a special proof as provided for in Rule 18 shall, when so required, bear the additional mark "S. P.," as set forth in Rule 41.

When choke-bored arms were first introduced in England, they were stamped thus:

London

Birmingham

Here the first figure (12B) indicates the gauge-classification (12) into which the weapon falls according to its bore diameter at the breech (B) (just ahead of the chamber), and the second (14M) that in which it is placed (14) by the bore diameter at the muzzle (M). This type of stamping is now obsolete.

A mark employed by the London Proof House prior to the adoption of the 1925 "Rules, Regulations and Scales," but rendered obsolete when these went into force, was a special stamp following a single (definitive) proof, thus:

Another early London mark, long superseded, and composed of three stampings conjoined, was the following:

FOREIGN-MADE barrels produced in countries having proof houses recognized as acceptable by the British Companies need not be reproved upon entry into England unless assembled into arms bearing the names of British makers, in which event they become subject to the usual British proof tests. Persons selling unproved arms or forging proof marks, are subject to fines of twenty pounds per weapon.

Apart from the proving of weapons for commercial sale, the British Government has always maintained its own system of proving and proof-marking weapons issued to its services. Thus, in addition to the broad arrow which indicates that the article upon which it appears is the property of the Crown, the current military proof stamp for rifles and automatic pistols is a crown surmounting the letters "G R" (Georgius Rex) (or a "V. R." for arms proved during

Victoria's reign, etc.), beneath which are two crossesd pennants over a letter "P" (proved). On military revolvers the broad arrow surmounting a crown is found on the frame, while the crossed pennants just described, appear on the cylinder and frame as well.

While the proving of gun barrels and actions is a highly desirable practice, and the international standardization of proof tests a consummation devoutly to be wished, it should be obvious that these do not serve to eliminate all possibility of accident. Arms may be tampered with after testing and stamping, metal being cut away from barrels and breeches in an effort to achieve extreme lightness of weight, only to result in the complete elimination of the factors of safety originally existing. Again, barrels or actions may give way because of the repeated use of excessive powder charges or of long continued corrosion, obstructions in the bore, etc. Nevertheless, the proof tests as today carried out in various European countries assure the purchaser of arms a degree of confidence in their soundness of fabrication which he would not otherwise enjoy.

Continental countries having established proof houses include Belgium, France, Spain, Germany, Austria, Hungary, Czecho-Slovakia, and Italy. In all of these save France, the proving of arms of domestic manufacture is obligatory. Indeed, much progress has been made toward the adoption of uniform proof regulations which will permit the recognition of the proof stamps of any one signatory by all other subscribing nations. An international convention to effect this was held in Brussels in July, 1914, and a reciprocal agreement on the subject entered into by some four countries (Belgium, France, Germany, and Italy) while others not officially represented (Austria, Hungary and Spain) have since agreed to adhere to it in principle. Unfortunately, before the document could be ratified the World War developed, and as a result its official adoption was long delayed, being finally consummated subsequent to a second convention which met in Brussells ten years later. It was officially ratified by Belgium in 1925, France in 1926, Germany in 1927, and Italy in 1928. In addition, Spain although not a signatory, has adhered to the provisions of the convention since 1923, as have Hungary and Austria since 1928. Czecho-Slovakia, the only other Continental country maintaining proof houses, has not as yet signified her adherence, and Great Britain has steadfastly held aloof. The agreement reached at the 1924 convention, reads as follows:

INTERNATIONAL CONVENTION FOR THE RECIPROCAL RECOGNITION OF PROOF MARKS ON FIRE ARMS

THE Governments of Germany, Belgium, France, and Italy, having recognized the advantage of concluding, upon the bases proposed by the International Technical Proof House Commission which met in Liége in May and June,

1911, a convention designed to establish uniform rules to be generally observed in the respective countries, and (to establish) official proof marks for fire arms, the undersigned, being duly empowered, have reached the following agreement:

Article 1: For measuring firing or proof pressures in sporting weapons, the proof houses will employ standardized instruments embodying the following characteristics:

A supporting block with screw closure on the Sauer system, and a firing mechanism including a safety attachment.

Cylindrical barrels in the usual sporting calibers, 70-cm. (28 inches) or more in length.

Chambers 65-mm. (26 inches) long, according to the dimensions currently in use in Great Britain and outlined in the table annexed (Table B).

Forcing cone 6-mm. long with corners not relieved.

Three crusher gauges of the French type, interchangeable on the barrels. Pistons 6.18-mm. in diameter on section; face area, 0.3 square centimeter; weight, approximately 3.27-grams.

On each barrel the axis of the first crusher gauge shall be 17-mm. from the breech, that of the second, 162-millimeters from the breech, and that of the third, 100-mm. from the muzzle.

The crusher cylinders (employed) shall be of copper 4.9 x 3.0 mm. in dimensions and will be supplied by the Central Laboratory of Powders and Nitrates at Paris.

Article 2: To measure firing or proof pressures in rifled muskets or carbines, the Proof Houses will employ standardized apparatus embodying features to be determined later by the Permanent International Commission on Small Arms envisioned in Article 7 of the present convention.

Article 3: For measuring firing or proof pressures in revolvers and automatic pistols, the Proof Houses will use standardized apparatus the characteristics of which will be determined under the same conditions as for the arms referred to in Article 2.

Article 4: A sample of each type of standardized apparatus will be placed in the Museum of Arts and Crafts, in Paris, to serve as examples of internationally standardized instruments.

Article 5: The contracting countries agree to recognize, as equivalent to the proof marks employed in their own national Proof Houses, the official proof marks of foreign Proof Houses whose regulations are not in conflict with the following:

A. The complete proof of a sporting gun will involve at least two tests, the first, a *provisional* proof conducted during the course of manufacture of the barrel, and a second, or *definitive* proof, applied after all parts of barrel and action have been machined to their final internal and external dimensions, or the entire arm finished in the white, or completely finished and ready for use.

B. For the definitive proof test, sporting arms may be classed as weapons designed, a—for use with black powder, or, b—for smokeless powder. A separate stamping will be employed to designate each of these categories.

C. For definitive proof of guns designed for black powder, the proof charge will be such as registers on the first crusher gauge of the standard apparatus a minimum pressure of: 620-kg. per square cm. for 12 gauge arms; 620-kg. per square cm. for 16 gauge arms.

D. For the proof of rifled shoulder arms, and of revolvers and pistols of various calibers, the cartridges used will develop a pressure exceeding by at least 30 per cent. the average determined by firing a sufficiently large series of commercial cartridges of their caliber and type loaded either with black or smokeless powder.

TABLE B: Minimum Standard Dimensions for Shotgun Chambers

Established by the "Gunmakers' Association" of London and adopted by the "Birmingham and Provincial Gunmakers' Association" and by British ammunition manufacturers.

Designation		Chamber			Recess for Shell Head		
Gauge	Nominal Length	Length	Diameter at Forward End	Diameter at Rear End	Diameter	Depth	Radius of the Arc
	Inches	Inches	Inches	Inches	Inches	Inches	Inches
4	4	4.000	1.035	1.090	1.200	0.130	0.030
8	3 1/4	3.250	0.914	0.930	1.035	0.115	0.020
10	3 1/4	3.250	0.845	0.861	0.933	0.074	0.020
10	2 7/8	2.875	0.845	0.859	0.933	0.074	0.020
12	3	3.000	0.800	0.815	0.886	0.074	0.020
12	2 3/4	2.750	0.800	0.813	0.886	0.074	0.020
12	2 1/2	2.560	0.800	0.812	0.886	0.074	0.020
14	2 1/2	2.560	0.763	0.775	0.847	0.068	0.020
16	2 3/4	2.750	0.732	0.745	0.815	0.062	0.020
16	2 1/2	2.560	0.732	0.744	0.815	0.062	0.020
20	2 3/4	2.750	0.685	0.698	0.766	0.060	0.020
20	2 1/2	2.560	0.685	0.698	0.766	0.060	0.020
24	2 1/2	2.500	0.649	0.661	0.728	0.060	0.020
28	2 1/2	2.500	0.614	0.626	0.688	0.060	0.020
32	2 1/2	2.500	0.562	0.574	0.636	0.060	0.099
410	2	2.000	0.465	0.475	0.537	0.060	0.015
360	1 3/4	1.750	0.415	0.424	0.479	0.050	0.015

Article 6: For sporting guns, each of the contracting countries will not grant its official recognition save to proof marks indicating *definitive* tests with black or smokeless powder, undergone by the arms when *complete and ready for use.*

Article 7: In order to make it possible to determine that the various Proof Houses are conforming to the preceding conditions governing their activities, and to continue to work toward improving and amplifying these, the contracting states agree to set up a commission designated as the Permanent International Commission on Small Arms at Brussels.

Since this convention of 1924, three others have taken place (in Brussels in October, 1929, in Liége in June, 1930, and in Paris in September, 1931. A fourth is scheduled for Rome in 1933). These sessions have been attended by delegates from the various signatories to the 1924 convention, plus official observers from Great Britain and Holland (1930) and Holland and Sweden (1931). Unfortunately, the United States has been represented on no occasion. Considerable progress has been made toward determining the specifications of crusher gauges to be used in testing shotguns, rifles, and pistols, the preparation of tarage tables, the proper dimensions for standard shotgun chambers, etc. (*To be continued.*)

A. D. 1936

Fact or Fantasy on Army Mechanization?

By Robert J. Icks*

GRADUAL, concerted disarmament is finally taking place throughout the world. The United States can claim a great share of the credit for bringing it about, not by the efforts of the carping pacifists but through the example of a country aroused by Europe's heedless arming.

The Geneva Conference on Disarmament in the autumn of 1933 got off to the same halting start as had previous conferences, except that a few nations were beginning to complain about the United States naval building program as being contrary to the spirit of the conference. It was not until the President of the United States released the millions of dollars available in the huge Public Works program for the mechanization and motorization of the Army, that foreign governments began to see the advantages of disarmament and a definite plan was agreed upon which was acceptable even to the jingoes of continental Europe and Asia. Not only did the program aid unemployment, which was, of course, the principal purpose, but it trained manufacturers for possible war-time duties, and it brought the Army to a standard of equipment and efficiency second to none in the world.

As the plan had been originally, it was the intent to purchase motor vehicles of various kinds of standard manufacture as well as to build armored fighting vehicles of definite types. Two kinds of tanks were contemplated, the Christie type, and a light type based on the T1 E4 model. Fortunately, that part of the plan which dealt with tanks was not carried out. Had the orders been placed it is likely that the Army would have had to wait many years for replacements of vehicles which would not have been entirely satisfactory when they were purchased.

Instead of ordering a large number of the Christie type, only a few were built, embodying the results of much experience. These were subjected to an intensive test, a few more were built incorporating the required changes, and finally, at the end of 1934, orders were let for a worthwhile number with the knowledge that a design had been achieved which would stand superior for many years.

IN the meantime, a similar process had taken place with respect to the light tank project. Nine hundred and fifty light tanks on the Renault design had been built during the World War at a tremendous cost and were obsolescent. The hulls and armor, however, were satisfactory for light tank use, and the authorities were finally persuaded to modify these hulls, thereby effecting a very considerable saving.

The modifications proposed were the application of the Christie suspension, the substitution of an air-cooled engine, and an increase in armament. About this time it became known that an English modification permitted the adaptation of a device to make light tanks amphibious. The value of such an improvement being recognized, steps were taken to incorporate such a device on our tanks. As a result, five 6-ton tanks were modified in various ways: all with Christie suspension (but with various kinds of tracks), using one set fewer wheels, but some with radial air-cooled engines (requiring no lengthening of the hull) and some with automobile type engines; some with machine guns mounted in pairs in the turret; some with a machine gun and an improved 37-mm. gun in a combination mount; all with radio; and two with provision for making the tanks amphibious. This latter change was made by building sheet metal floats filled with balsa wood and placing them over the tracks and under the hull, and by redesigning the rear crank outlet to permit a propeller shaft and screw propeller to be used. Above this was a small rudder.

After completion of the pilot modifications, the same intensive tests were made as with the Christie machines and finally, contracts were let with various manufacturers to modify the remaining 6-ton tanks. About one-fourth were made into amphibious tanks and the balance into standard land tanks, the armament ratios about two-fifths with one caliber .50 and one caliber .30 machine gun and the balance with paired caliber .30 machine guns. The contracts were completed near the end of 1934 and distribution was made to the Regular Army and to the National Guard.

THE result of the release of funds by the President was that the United States Army is now almost completely motorized—Infantry, Artillery, Cavalry, Engineers, Signal Corps, Quartermaster Corps, and Ordnance Department. The Cavalry armored car units use the Christie vehicles, the Infantry use them as command cars and medium tanks, while both Cavalry and Infantry (Regular and National Guard) use the modified 6-ton tanks in their combat car and tank units. The National Guard cavalry took over the armored cars formerly used by the Regular Army and a few others were built for them.

At the same time that the motorization and mechanization projects were taking place, many Army posts were abandoned and troops were grouped by units not smaller than brigades. The advantages of this had long been obvious but political considerations had always prevented any change. At the present time the Army is efficiently grouped for defense and for training in a comparatively few centers of population, ready for duty immediately and modernly equipped to defend us against any nation.

Perhaps more than any other factor, this mailed fist in the velvet glove produced a changed atmosphere at Geneva in 1933 and 1934, and now, in 1936, it is an accomplished fact that disarmament is definitely on its way. At home, too, this project for the modernization of our Army, played its part in assisting to overthrow the forces of depression along with the balance of the Public Works program and the many other programs developed for this purpose. It gave employment to unemployed workers. It gave experience to men, machines, engineers, executives and organizations—peace-time educational experience and familiarity with the manufacture of military equipment—a priceless national defense possession indeed.

*Coauthor (with Rarey and Jones) "The Fighting Tanks." First Lieutenant Infantry (Tanks) Reserve.

Gas Masks

Progress in Protection Against War Chemicals

By Alden H. Waitt*

WARFARE from the Middle Ages until the World War meant cold steel or hot splinters and fast-moving metals propelled by explosive chemicals. The stalemate that was reached quickly on the Western Front in 1914 brought in trench warfare and with it a new factor to be reckoned with by the military, the direct action of chemicals as weapons.

When the soldier put on a mask to protect himself from the new weapon, some think the glory of war was dimmed. No longer did he look the dashing hero. Instead, face covered with rubber and snout dangling in front, he seemed like some queer beast from another planet. In his new armor, however, he was safe against the molecules that would have injured him otherwise. Since that time the gas mask has become a part of his normal equipment. He has not minded the appearance or worried about the loss of his former glory. Perhaps the muck and mud of the trenches has destroyed his delusions of grandeur. The soldier, however, has insisted that his means of protection be comfortable, as well as protective, and he has demanded a device in which he can fight without undue loss of efficiency.

The direct action of chemicals added another dimension to weapons. Chemical warfare has introduced the element of time and thus brought a new conception to war, just as relativity by the introduction of time has brought a new conception to scientific philosophy. The problem of war in the future must be solved with a consideration of this. Hereafter when a shell bursts its effects may not be over when the fragments lose their kinetic energy. The shell may contain a chemical which, released into the air, will move slowly with the wind over many yards of space for considerable time. Both the space and time, however, are subject to control by the chemical officer with proper knowledge of atmospheric and wind conditions. The ground, saturated with the chemical, may give up a dangerous or intolerable concentration for several hours or days. A commander may not send his troops forward into territory which appears unoccupied without first making sure that invisible molecules of gas are not waiting there to do the work that cold steel and hot splinters did in former wars. The approach march, the movement into battle position, must be made with the possibility of gas in mind. The fact that troops have protective devices against chemicals may permit them to pass through gas-laden areas, but even the best equipment causes some slowing of movement. The commander will have to take this into account in estimating his time schedule. The introduction of chemicals puts an even greater premium on clear and accurate thinking in war, and demands more careful organization and coördination.

THE question of protection against gas is a primary one in any discussion of war, for without a good gas mask the best equipped and most skillfully trained army is helpless against an opponent armed with chemicals. When the first gas attack was made by the Germans against the Allies, there was no such thing as a military mask. Twenty thousand men became casualties. Less than two weeks later, a crude form of protection had been attained in the form of pads of cotton saturated with a neutralizing solution, designed to cover mouth and nose. From then on the quality of the antigas apparatus was improved step by step.

The defense generally kept just ahead of the offense and at the end of the war our Army had a mask that stopped every gas the enemy could use. There were gas casualties to be sure, but they were not due to the failure of the mask. Failure to put it on in time or premature removal was responsible for most of the casualties. The best mask in the world is useless if it is not worn properly. Indeed, cases were reported of soldiers who had been rushed into the lines without sufficient training and were found wearing the gas mask on the chest, ignorant of the fact that it must be adjusted to the face. They thought that since the gas affected their lungs, the correct place to wear it was over the chest.

WHEN America entered the war, chemical warfare was two years old and had become well established. Each of the combatants had developed adequate protection against gas and each had carried on the development independently so that there was a great variety of masks in use. No systematic exchange of ideas existed among the Allies at this time. France, England, Russia, and the Central Powers placed their reliance on widely different appliances.

We had no gas mask nor any agency for providing gas defense. The hastily organized Gas Defense Division of the Army, working with the Bureau of Mines, decided that the British Small Box Respirator offered the best possibilities. This respirator, universally known as the S. B. R., consisted of a box containing layers of charcoal and soda lime connected by a flexible tube to a facepiece of rubberized cloth which covered the entire face and was attached to the head by elastic tapes. It differed materially from French and German types in that it had what was termed the double line of protection. The air from the filter box passed to the lungs of the wearer through a flexible tube to a rubber mouthpiece held between the teeth. Exhaled air and saliva passed out through a valve in the metal angle joining the flexible tube to the mouthpiece. A pair of spring clips closed the nose. All air breathed entered the lungs through the filter. The facepiece protected eyes and face, and gave double protection to the lungs.

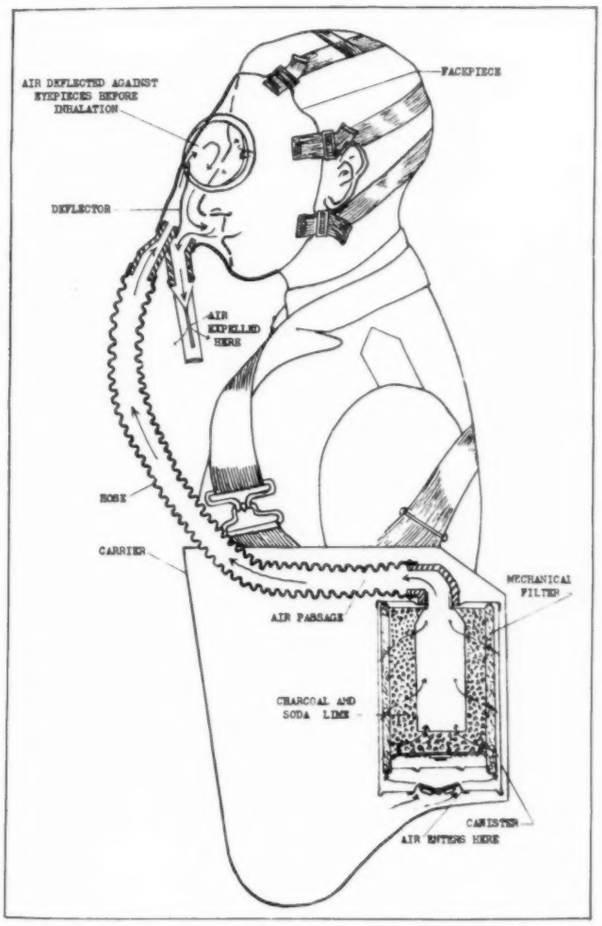
All Americans who served in the World War will remember vividly the S. B. R., for it was the type we used until late in 1918. There was hardly a wearer who did not curse wholeheartedly the clamps upon his nose, the mouthful of rubber carried between the teeth, and the fogging of the lenses in cold weather. Nevertheless, he was grateful for the complete protection given by this uncomfortable contrivance, the most effective of any gas mask in general use.

As soon as the S. B. R. was adopted by the War Department work was started on 25,000. These were produced in record time, but proved faulty. Their failure, however, put our experts on their mettle and before long satisfactory box respirators were being manufactured by the million. The war-

*Instructor, Chemical Warfare Service School, Edgewood Arsenal, Md. Captain, Chemical Warfare Service, U. S. Army.

time type upon which production was concentrated was known as the R. F. K. (Richardson, Flory, Kops). It was introduced in February, 1918, and over three million were made. The R. F. K. still was the British S. B. R. with improvements in comfort and effectiveness, but with no radical differences.

OUR Research Division recognized the importance of getting away from the uncomfortable nose clips and mouthpieces.



THE STANDARD U. S. ARMY GAS MASK.

More comfort was imperative because the use of mustard gas required that masks be worn for long periods of time. The French had developed for their artillerymen and certain specialists a respirator known as the Tissot mask. It was somewhat bulky but was comfortable and could be worn for long periods without difficulty. A box carried on the back contained materials to absorb the gases. This was connected by a rubber-covered metal tube to the facepiece, a thin mask of high grade rubber. The air passed through the box, in which charcoal and soda lime filtered out the gases, then through the connecting tube to the facepiece. At this point the tubing branched off into two parts, conducting the air across the eyepieces to prevent fogging. Exhaled air was expelled through a rubber outlet valve.

The Tissot facepiece was the best in comfort and design of any issued to troops during the war, but it was expensive, difficult to manufacture and fragile. Safety depended upon the fit of the facepiece. It had no mouthpiece or nose clip.

Tendency in this country gradually swung toward the adoption of the Tissot facepiece, and, as a result, two Tissot type masks were developed, known as the A. T. (Akron Tissot) and the K. T. (Kops Tissot). About half a million of these two masks were made before the Armistice. Both face pieces dispensed with the objectionable features of the R. F. K. and included the Tissot principle of deflecting the incoming dry air across the eye lenses.

The principal objection to the A. T. and K. T. was that, like the French Tissot, they were difficult to manufacture on a large scale. They represented a radical departure from the S. B. R., since they depended entirely on the fit of the facepiece. The design, however, assured a good fit and the construction of the material was strong enough to eliminate danger of tearing. Increased comfort, clearer vision, and lowered breathing resistance justified the adoption of the Tissot type.

MEANWHILE, work on the filter had kept up with other developments. All nations had selected charcoal as the principal material in the gas mask canister for removing war gases from the air. Charcoal, when subjected to treatment by heat and steam, is made more active as an absorbent. It is given a very fine porous structure and, hence, greatly increased surface. At the same time compounds which interfere with its power to attract and hold gases are driven off. When air containing war gases is passed through granules of activated

THE R. F. K. (RICHARDSON, FLORY, KOPS) GAS MASK.

charcoal, the molecules of the gases are adsorbed, that is attracted and held on the surfaces of the pores somewhat as iron filings are held on the surface of a magnet. The purified air is not adsorbed and passes through.

Charcoal, however, does not hold tightly enough certain volatile acid gases, such as phosgene. It was found necessary to mix with it soda lime, a material with a high capacity for fixing these gases. Charcoal and soda lime form a splendid team. The soda lime acts principally as a reservoir for the permanent fixation of the more fugitive gases, while the charcoal furnishes the necessary activity for all gases, as well as high capacity for holding the less volatile ones, such as mustard gas. Where one is deficient, the other is adequate. Thus, while the capacity of charcoal is decreased by heat and humidity, the soda lime becomes more reactive under such conditions.

When America started making respirators, a canister larger than the British was made, since it was feared that the charcoal we had was inferior. Actually our charcoal proved so much better than that used by our Allies that it was possible greatly to reduce the size of later canisters.

The use of the Blue Cross shell by the Germans made it necessary to have a mechanical filter in addition to the absorbing chemicals. Blue Cross was an irritant solid which added to high explosive artillery shell was, on explosion, thrown into the air in very small particles. These particles being solids were not held by charcoal or soda lime and passed through the canister, causing sneezing and nausea to the wearer. Cotton pads, layers of paper and cellulose were used in the gas masks to filter out these small particles of irritant smoke. Felt was found to be the most effective filtering material. As the war came to a close, felt was being incorporated in the experimental canisters that were to be used with post-war masks.

During the year and a-half America was at war, over five and a-half million gas masks were produced. With the A. T. and K. T. masks we possessed the best that there was in comfort and safety. When it was decided that these types were not well adapted to the large-scale manufacture demanded by our rapidly growing Army, development was started to produce a simpler facepiece that would combine all the advantages of the preceding types. The result was the 1919 mask, production of which began just before the Armistice.

The 1919 mask was made from a special rubber compound which came in long sheets, on the outside of which cotton stockinette was vulcanized. The facepiece was died out of the flat sheet, in such a design that a single seam at the chin of the completed mask produced the proper shape to fit the face.

THE flat punched-out piece contained two elliptical holes for the eyepieces. The elliptical shape of the holes produced an uneven tension which caused the eyepieces, when inserted, to bulge forward. This ingenious arrangement also resulted in a tension which pulled the edges of the facepiece flat against the temples, assuring a good fit at this part of the face. Eyepieces were made of non-shatterable glass, similar to that now used in automobile windshields. They were kept clear by the Tissot principle of deflecting the cool inspired air across the lenses. A rubber deflector above the angletube accomplished this.

The sewing of the chin seam to shape the facepiece produced a hole at the lower part of the mask in which the metal angle tube was inserted and attached to the rubber hose leading to the canister. An improved head harness which was self-centering added to sureness of adjustment and comfort.

The blue canister, which formed a part of the 1919 gas mask, provided the most complete protection attained up to that time. It contained charcoal and soda lime of a higher activity, surrounded by a mechanical filter of felt to remove the fine particles of irritant smokes.

THE BRITISH S. B. R. (SMALL BOX RESPIRATOR) SHOWING NOSE CLIPS AND MOUTHPIECE.

The design of the carrier for holding the respirator was a complete departure from all previous ones. With a few minor changes, it is the same as now in use. It is an irregular shaped canvas satchel provided with adjustable shoulder and waist straps and is carried under the left arm. The mask is withdrawn through an opening that comes just above the waist and is adjusted to the face without change of position of the carrier as was necessary with the war-time satchel.

The side carrier is the result of the demands of the soldier for a simple and comfortable container for the mask. The war-time satchels were carried in two positions —slung over the shoulder and worn at the side in rear areas where there was slight danger of gas, and raised to the chest in what was called the alert position when near the front lines. Considerable instruction was needed to assure proper carrying and adjustment of the two-position satchel, and the position of the gas mask on the chest was an awkward one. Men complained that when crawling over the ground while under enemy fire, the gas mask on the chest hampered them and did not permit them to get close enough to the ground. The desire to be as close to mother earth as possible under such circum-

THE FRENCH TISSOT MASK.

stances is easily appreciated. The side carrier did away with these difficulties. It is always in the alert position, does not interfere seriously with movement, is more comfortable to wear, and better protects the entire mask from moisture and other harm.

WHILE the gas mask in use today seems to differ little in outward appearances from the 1919 mask, it is really a much altered and greatly improved apparatus. Noteworthy progress has been made in providing a better gas mask for the Army. There have been many important improvements in comfort and dependability which are apparent to the wearer, but of even more importance, although not so apparent, is the progress in ability to manufacture on a large scale, reduction of costs, and increase in life of the mask.

Comfort when applied to the gas mask is purely relative. No one has ever produced a mask that is a joy to wear. We wear them because we have to. Comparative comfort is progress, and comparative comfort has been attained in our post-war respirators.

The use of the voice is necessary and it was not easy to converse or give commands while wearing the gas mask. The Navy, especially, needed a mask that would permit the transmission of the voice through speaking tubes and ship telephones. To meet the demands of the using services, the diaphragm gas mask was designed. It is similar to the regular service type, except that the angle tube is made to include a diaphragm of thin material protected by guards of perforated metal on each side. This increases voice transmission greatly. Over the telephone voice transmission in the diaphragm mask is about the same as without the mask. It provides good voice transmission in direct conversation.

THE A. T. (AKRON TISSOT) MASK, A WORLD WAR DEVELOPMENT OF THE TISSOT.

The eyepiece, of course, is a vital part of any mask. Battle efficiency is seriously impaired if vision is impaired. Although the special eye lenses will not shatter or break, they may be cracked by a sharp blow. A cracked lense gives decreased visibility and should be replaced. In the 1919 design, replacement of the lenses was impossible. In the designs which followed it, screw-type eyepieces were introduced to permit changing lenses without shipping the facepiece back to a repair depot.

STANDARD DIAPHRAM MASK.

For a long time the head harness was one of the weakest points in the gas mask. It seems an insignificant part of the mask, but it has given much trouble. After a mask has been in use a year or two, the elastic tape that holds the facepiece to the head becomes stretched, or the elasticity is lost and the whole face mask is useless. If the straps are loose gas can get in at the sides of the face or over the temples. In the 1919 mask the head harness was sewed directly to the rubber facepiece. Adjustment was made by buckles in the harness.

It was not until several years later that the detachable head harness was adopted. Instead of sewing the buckles to the harness, they are now sewed to the facepiece. Thus a new harness can be attached in a few seconds, without sewing. A simpler harness is possible. The next step may be to substitute light metal springs in place of the elastic tape. Thus a more durable strap will be obtained and one more use for rubber will be eliminated.

THE K. T. (KOPS TISSOT) GAS MASK.

In 1925, a change was made in procurement and production that not only speeded up manufacturing methods, but improved quality very materially. Up until that time facepieces had been died out of sheets of calendered rubber. These sheets came to the factory in large rolls. The change consisted in using rubber face blanks molded to exact size and shape.

The advantages of the molded face blank are many. In the first place, the operation of cutting out the facepieces is eliminated. There is a saving in raw material as well as time. Of even greater importance is the fact that a far better rubber is obtained. The calendered stock used previously could not be vulcanized properly. Consequently, it did not stand up well in storage; its aging properties were uncertain and poor. Molded rubber stock, on the other hand, may be vulcanized satisfactorily; a uniform product is obtained and the life of the rubber greatly increased.

LONG life is most important in the gas mask. We have to keep in storage for war reserve enough gas masks to equip all troops who depart for a theater of operations at the outbreak of a war.

The life of rubber at best is uncertain. After a number of years in storage a poor quality rubber may have deteriorated to such an extent that the facepiece is hard and stiff and will no longer conform to the face. It may break and crack. Obviously, we require assurance that our war reserve of gas masks is in good condition. There must be no time lag in getting perfect masks into the hands of our troops as soon as they are mobilized. Consequently, everything that tends to improve the quality of the rubber facepiece increases our ability to maintain a necessary war reserve. By increasing the life of the rubber, we can use our limited funds for war reserve production to better advantage. Again the life of the

rubber should be predictable. Since the molded face blanks all can be vulcanized alike, there is more chance of predicting the condition of the rubber after ten years time than there is with calendered stock which cannot be vulcanized uniformly.

Another advantage in the molded faceblank is the attachment of patches on the sides, to which the buckle tabs for the head harness are sewed. This operation previously was done by cementing the patches by hand after the facepiece was punched out of the sheet. Now the patches are vulcanized in the mold, which gives absolute adherence and saves an operation which took time and personnel.

Such improvements, although they do not appear on the surface, are real and valuable. They represent definite progress. They never can be measured in dollars and cents, but they may make the difference between success or failure in equipping and protecting a large army.

Air, sunlight, and heat are the enemies of rubber. Oxygen gradually causes rubber to harden and lose its elasticity. Rubber chemists found that the addition of certain chemicals to rubber slows down the action of the oxygen so that the rubber lasts longer. The chemical compounds that accomplish this are called antioxidants. Their use was adopted by the Chemical Warfare Service in 1926. As a result, we now have an expected life of 10 years for facepieces in actual service, where ten years ago we could not be certain of four years for masks in storage.

It was found that life in storage could be further increased by sealing the complete gas mask in neutral storage containers. All air is expelled from these containers and is replaced by an inert gas such as nitrogen. Thus sealed away from air and sunlight and kept in as cool a place as is available, we may expect an indefinite life for our war reserve of masks. The problems in accomplishing these seemingly easy advances were many and were solved only after thoughtful research and many disappointing reverses.

THE comfort of the gas mask depends upon the ease with which one may breathe as well as the fit of the facepiece. Resistance to breathing is centered to a considerable extent in the canister. It is not easy to increase the effectiveness of the canister without increasing the difficulty of drawing air through it. Every change in the chemical contents or the mechanical filter must be made without making the resistance to breathing so great that the wearer of the mask has to make an effort to fill his lungs.

The use of the felt filter to protect against the fine particles of the irritant smokes caused very little increase in breathing resistance over late war-time canisters, since it was made with a large surface entirely surrounding the chemicals. War-time filters had absorbent cotton pads in layers; these presented a small surface. Breathing resistance was high and protection was low. The felt filter was expensive, however. Each filter cost over a dollar; the material was a high grade wool difficult to procure and in great demand. Further, the felt could not be made uniformly, and there was a danger of pin holes which would permit leakage.

The construction of the filter in the present canister is one of the greatest accomplishments in post-war gas mask development. A new type filter has been devised that makes use of a waste product of nearly unlimited supply. The very nature of its construction assures the elimination of pin holes. It is well adapted to large-scale production. This filter, which entirely replaced the felt filter and is used in the present M IV canister, costs only a small fraction of the felt filter. It has a lower breathing resistance and, at the same time, gives better protection against the irritant smokes.

Although service gas masks are not suitable for use by firemen, since they do not protect against carbon monoxide, they have been used because they filter out smoke. Such use is dangerous and unauthorized, but was common. It was found that certain smokes, particularly the dense clouds from burning electrical insulation such as bakelite, penetrated even the blue canister with the felt filter. A test of the new type filter against heavy clouds of this fine particulate smoke resulted in complete protection. It is indeed the most effective filter for removing smokes of all kinds that has ever been provided for the gas mask.

The chemicals in the canister have undergone little change in the years since the war. We still pin our faith to charcoal and soda lime. The quality of these materials, however, has been improved. The activity of charcoal has been increased many times. The importance of this is apparent when it is considered that increased activity permits using less charcoal. A smaller canister is now possible without sacrifice of protection or increase in breathing resistance. The breathing resistance of the present standard M IV canister is about 25 per cent less than that of the early post-war canisters.

THE arrangement of the chemicals in the canister is very different from that of the war-time designs. The air, instead of passing upward through the chemicals from the bottom of the canister, now passes through radially, decreasing resistance to breathing.

The present M IV canister is an oblong-shaped metal box containing a combination gas and smoke filter. This filter is a perforated metal container, oval in shape, and filled with a mixture of 80 per cent charcoal and 20 per cent soda lime. The outer surface of the perforated container is covered with a specially prepared fibrous material which filters out the smokes. It is this material that replaced the felt. Air enters the canister through an inlet valve at the bottom and is drawn first through the smoke filter, and then passes through the chemicals to a central well. The air now purified passes out of the canister through a rubber tube to the facepiece.

Even small things, such as a change in the inlet valves, result in saving time and money. The blue canister of the 1919 mask had two small red rubber inlet valves at the top of the canister. These valves were used to admit air from outside and prevent the air breathed out by the wearer from going back into the canister. It was found possible in later designs to use one valve at the bottom of the canister. This one valve is a flat disk of rubber. The two that had been used were somewhat complicated little devices which deteriorated rapidly. The new one is much cheaper, easier to install, lasts longer, and is not easily torn. There are a few of these little red rubber valves still in use, but not in the gas mask canister. Occasionally they are seen in use as tees on the golf course. The dropping of a valve may have little of the romance of research. It is just a step on the road to progress, but contributing its part to cheapness and ease of manufacture, is well worth recalling.

TODAY there are two standard Army gas masks, the service mask, M 1-4-3, and the diaphragm mask. The service type mask, M 1-4-3 has the M I facepiece with replaceable eye lenses, and head harness, the M IV canister with latest smoke

Training the Non-Military User in the Technique of the Gas Mask.

filter, and the M II side carrier is also a component of it.

The diaphragm mask is the same as the service mask, except that the angle tube carries a diaphragm to give good voice transmission.

One question is always asked about the gas mask—"How long will it last"? This is a question impossible to answer categorically because it involves so many factors, concentration of gas, rate of breathing, temperature, humidity, and time of exposure. The best answer is that it will last through ordinary field use at least three months. By ordinary field use is meant the carrying at all times and wearing of the mask in occasional gas attacks that may be expected by troops in active operations. In any event, when the canister approaches the point where the chemicals have absorbed their limit, the gas will for some time pass through in small and harmless quantities which can be recognized by odor. The odor of the gas will give an indication that a new canister should be provided. It will be rare, however, that the canister as furnished with the present service mask will become exhausted before other causes, such as loss or accident in battle, have made its replacement necessary. The facepiece of the gas mask, if properly cared for, should outlive a number of canisters, the replacement of canisters which have served their useful life being readily accomplished.

The standard Army gas masks today not only give all protection that is required, but give it with a maximum of comfort. Interference with mobility and use of weapons has been so reduced that a man may work and fight in his mask without material loss of efficiency. Besides being an effective fighting mask, it is reasonable in cost and practicable for procurement and manufacture.

Assured of a satisfactory mask, the Chemical Warfare Service today is seeking a still better one. It is not enough to keep up with developments in offense, we must keep ahead. In accordance with the desires of the using branches our efforts are concentrated on developing a new type of mask which will be lighter, easier to wear for long periods, more compact, easier to carry, cheaper, and with better vision.

It must be emphasized, however, that even the best equipment is valueless unless used properly. Adequate training is needed in the use of any gas mask. Proper gas discipline must be maintained in order that gas casualties be kept to a minimum. The training of the soldier in protection against gas is the responsibility of commanding officers. This is recognized and in our Army today an increasing emphasis is being placed on gas discipline and measures against possible enemy chemicals. In view of this and the protection furnished by our protective equipment, there is every reason to believe that our Army may enter any future emergency confident of its ability to meet successfully every form of chemical attack.

An Effective Smoke Screen.

Inspecting Munitions Production

A Discussion of Mr. Millar's "Plea for Munitions Quality"

By Roy D. Burdick*

THIS article was prepared by Captain Burdick at the request of the Editor. It discusses the questions raised by Mr. Preston S. Millar, President, Electrical Testing Laboratories, New York, N. Y., in an article, "A Plea for Munitions Quality — Our Commercial Testing Laboratories Should be Utilized in War," which was published in the September-October, 1933, issue of this Journal. It is our purpose in this note to add a word of comment on the underlying idea in the publication of the two articles.

ARMY ORDNANCE no longer conceives its sole purpose to be the mere setting forth in cold type of desecriptions of matériel, technical analyses of engineering details of new equipment—bills of material, as it were, with which our military forces will march to battle in any future emergency. This is a necessary and important function and it always will be fulfilled in these pages. However, there are matters which go deeper than this function among which are discussions such as Mr. Millar started in the last issue. In other words, the progress of American munitions, the attainment of industrial preparedness, the success or failure of the United States in any major emergency, will be measured directly by the degree of thought applied to munitions problems in time of peace. Hence any dignified expression of qualified opinion, be it on matters of policy or technique, should be given every opportunity of expression and debate. By this means thought is stimulated, divergencies of viewpoint are clarified and, in the end, sound progress is the result.

Readers of this Journal are the reservoir of vitalizing thought on questions within its scope. They can render no greater service to American munitions than by encouraging expression of viewpoint—their own and others. And, without meaning to "preach," it should be said that when the thinking-out process declines so does real progress. On such a basis these pages will continue to contribute to the advancement of the cause to which they are dedicated always.—Editor.

IN his article entitled "A Plea for Munitions Quality" published in the September-October issue of ARMY ORDNANCE, Mr. Preston S. Millar portrays, with appropriate emphasis, the need for a sound and carefully planned system for the inspection of war matériel in the event of an emergency of major proportions. Mr. Millar sets forth some of the World War defects of the system—or lack of system—employed at that time for the inspection of manufactured articles of supply and equipment and poses the question "what provision should be made for application in the hectic and strenuous days following M-day to insure that the matériel delivered for war purposes shall continue to be as nearly as practicable just what is wanted?" He then pleads for the establishment of a system whereunder commercial testing laboratories and inspecting agencies would be utilized to determine the satisfactoriness of commodities purchased. After stating what he perceives to be the advantages from the adoption of such a system, he concludes with the expression of a suspicion "that we have not yet given adequate attention to inspection and testing services which commercial experience has shown to be such an important auxiliary to production arrangements."

Presumably the matter pictured in Mr. Millar's dissertation has application to the production of supplies and equipment not only for the War Department but also for other agencies but, for obvious reasons, this discussion will be confined to the interest which the War Department has in the subject.

It seems logical that any discussion of the subject should have as a point of departure a consideration of the objective to be striven for in the preparation of plans for carrying out the necessary inspection of the production of munitions of war. Obviously the satisfactoriness of an article of equipment or supply does not depend solely on its conformity to the provisions of a preconceived specification for the article. While it may be a sound presumption that the specification takes into account all the desirable characteristics which the article should possess to render it of a quality commensurate with the use to which it is to be put, it does not necessarily follow that a blind adherence to the requirements of the specification will be productive of the results sought. Rather, it always must be borne in mind that the criterion on which acceptance or rejection of a completed article should be based is its ability to perform its functions in a reasonably satisfactory manner. In other words, when time is at a premium and every resource is being taxed to speed up production, the desire for conformity to the details of specifications must be balanced against the necessity of maintaining an uninterrupted flow of supplies from factory to troops. In every circumstance where doubt exists as to the propriety of acceptance of an article this question must be answered, "Will it work?"

This does not mean that specifications should be treated lightly or that their requirements should be waived without cogent reason. It does mean, however, that the individual charged with responsibility for decision in such moot cases must be imbued with the spirit of accomplishment at the end of a production line while at the same time he must zealously guard against any tendency to overlook deficiencies which may cause damage at the point of use of the articles in question—damage which conceivably even may extend to the loss of life. To possess the ability to determine just where the line between acceptance and rejection should be drawn, such an individual must have knowledge not only of the terms and intent of specifications and of the technical manufacturing processes involved but also of the conditions under which the product he is passing upon is to be employed.

*On duty in the Planning Branch, Office of the Assistant Secretary of War. Captain, Corps of Engineers, U. S. Army.

The question of the establishment of a system for the testing and inspection of war matériel revolves around considerations of personnel, its sources and qualifications.

THE plans evolved and the preparations made in the War Department for carrying out this phase of war procurement necessarily vary according to the nature of the problems to be met by the different supply arms and services. Manifestly the process of inspecting the manufacture of textile articles will be quite different from that involved in seeing that the various parts of a time fuze are properly constructed. The personnel employed will be of radically different types, each having been trained along quite different lines. Likewise, inspection methods will be entirely unlike for the different processes involved in the manufacture of the same article. Surveillance over the metallurgy of the steel for gun castings would not be accomplished by the man who gauges the dimensions of a finished gun tube and passes on the quality of the machine work.

In spite of these variations in the type of inspection service to be performed it constitutes a safe generality to say that all our plans for providing such service in sufficient quantity and of satisfactory quality are based on the same important principle. This principle is that the man in a factory, who is to shoulder the responsibility for insuring satisfactory quality and for aiding in every way possible the speedy flow of materials through the stages of production must be answerable directly to the Government. He must be more than a mere checker of machine work against blue-printed dimensions. He must be a representative of the Government, qualified to comprehend the difference between slight, inconsequential departures from specifications and defects of quality or dimension of such importance as to vitally impair the usefulness of the finished product. Above all he must be capable of making and vested with authority to make decisions. On such a man it is contemplated that the uniform of a commissioned officer will be placed as a badge of his authority and to give him the prestige of a responsible official of the War Department. As to whether or not the man who manipulates a set of gauges or juggles test tubes and retorts wears a uniform seems relatively unimportant.

IT has been mentioned that the determination of suitability of manufactured articles involves many different processes of inspecting and testing. Many of these are of such a nature that they can readily be turned over to commercial and other testing laboratories. One can readily agree with Mr. Millar that to fail to utilize the splendid facilities of such agencies would be a sacrifice of the advantages to be gained by employing the services of trained experts. It is believed that our plans for inspection of war materials do, in general, contemplate the utilization whenever feasible of these established and valuable testing institutions. But to turn over the job of inspecting the production of matériel from raw material to finished product is quite another story. The testing laboratories are essentially fact-finding agencies. That they can determine the facts as to quality of an article more quickly and accurately than can any emergency organization of inspectors and testers goes without saying. However it does not follow that they can efficiently take on the job of reconciling the determined facts with the needs of the service. There must be a meeting ground where technical information is translated into terms of performance requirements. It would seem that that meeting ground, that reconciliation, must be in the minds of our chief inspectors.

Mr. Millar's point that peace-time preparedness measures should include organization of the commercial testing laboratories for service to the country in war time has not been overlooked. It is pointed out, however, that for the technical fact-finding rôle in which it is herein contended that they should be cast, they need no special organization or orientation. They can test the tensile strength and the chemical content of a coupon from a steel casting just as well in their peace-time form as though they were organized especially for a war-time function.

WHAT the Government does particularly need as an element of preparedness is a well stocked reservoir from which to draw the corps of inspectors who are to operate as Government personnel. This need is partially met by the training given to the personnel of our Government arsenals and laboratories. In the Ordnance Department, which all will concede is faced with the most severe inspection problem of all the War Department purchasing agencies, the matter of peace-time training of inspection personnel has been carried to the point of actually selecting as large a quota of such personnel as possible and training it in its war-time duties as fully as may be done under peace-time conditions. Other supply arms and services are meeting the problem in the manner best adapted to the circumstances under which they must operate. Through the various measures which have been adopted there is provided a nucleus of trained personnel and the balance must be drawn from the commercial testing laboratories and other sources and given the training in the military aspects of their jobs after M-day. This seems to be about as far as we can go within the limitations of available funds and in keeping with the spirit of the National Defense Act. Just as we maintain in peace time a cadre of professional soldiery and rely for the bulk of a war-time army on men to be trained after M-day, so we also must do with respect to our inspectors of war materials.

To summarize, attempt has been made in the foregoing to emphasize certain concepts of the inspecting and testing problem. First, the objective to be worked toward is to so organize our inspection service that safeguards against defective material will be provided while at the same time unnecessary obstacles to speed of production will not be set up. Second, to successfully meet this objective it is required that control of inspections shall be placed in the hands of men having knowledge of technical processes on the one hand and of military needs on the other. Third, we would be much remiss if we failed to take full advantage of the capabilities of the established institutions for performing inspection and testing service. Finally, it is submitted that the procurement plans of the War Department do in fact include the intention to resort to the measures outlined and contain appropriate provision for carrying out that intention.

It is of course true that none of our plans has reached such a state of perfection that we can neglect any opportunity for improvement. If Mr. Millar's suspicion that we are not giving adequate attention to inspection and testing services be justified, then it is indeed high time that we give heed to what he says. The proper solution, however, would seem to be a combination of what he advocates with a system under which the Government retains control of these services instead of relinquishing such control to outside agencies, even though they are of the highest type and are motivated by the most unselfish and public-spirited purpose. That, at least, is the solution which would seem to be most satisfactory and efficient.

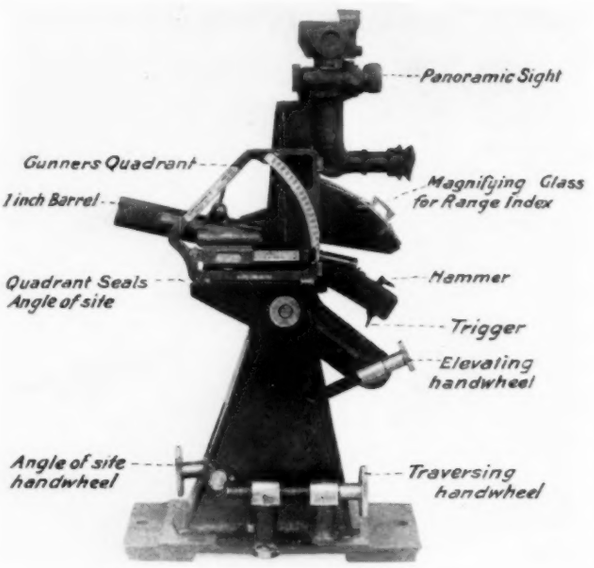
A Miniature French 75

The Field Artillery Training Gun, M2

By D. A. Gurney and T. A. Conlon*

THERE are under manufacture for use with the Field Artillery units of the Regular Army, National Guard and Reserve Officers' Training Corps, several hundred miniature gun mounts, known as the Field Artillery Trainer, M2. These mounts were designed in response to the request of the Chief of Field Artillery for a device which would simulate the firing of the French 75-mm. gun at 1/100 of its range. Manufacture in quantity has been inaugurated after the test and approval of the second battery of the trainers by the Field Artillery Board at Fort Bragg, N. C.

As designed, the trainers possess all the essential characteristics of a gun mount: —elevating, traversing and angle of site mechanisms, a range scale graduated in yards, a standard panoramic sight and provisions for reading angle of site and elevation by the standard gunner's quadrant. The gun is a caliber .22 rifle modified to receive a 1-inch barrel. The projectile is a 1-inch steel ball and the propellant a caliber .22 short, blank cartridge. The probable error is proportional to that of the French 75-mm. gun. The projectiles are visible in flight and may be retrieved and used over and over again.



THE FIELD ARTILLERY TRAINING GUN.

The differences that might be expected between lots of ammunition bought in the open market has been anticipated and controlled by the use of spacers inserted in the 1-inch barrel, thereby limiting the travel of the projectile in the bore with resulting increase or reduction in range as the length of spacer is changed.

The mounts are set-up on a platform in batteries of four and may be spaced on the platform to suit the desired problem. The 1-inch barrel may be screwed out or in on the caliber .22 gun to allow for slight irregularities in range within the battery.

THE development of this trainer has been the result of numerous experiments based upon the specifications as laid down by Maj. Gen. H. G. Bishop, Chief of Field Artillery, which called for a battery of miniature guns having a range of 1/100 of that of the French 75-mm. gun and a probable error no greater than that of the service ammunition. It must have an elevation of 45 degrees, an angle-of-site mechanism, and a traverse of 45 degrees. It must conveniently mount the standard panoramic sight by which deflection and deflection differences are set off In addition to a range scale, a seat should be provided for the gunner's quadrant for elevation in mils. The mounts in battery position must have a normal interval of 7.2-inches which is 1/100 of the normal spacing of guns in a 75-mm. battery. At such spacing each mount must be accessible for independent operation without interference with other guns in the battery.

It is evident that the first problem to be solved in this project was the discovery of a propelling means which would throw a small projectile 90 yards at 45 degrees elevation and within the required probable error. A series of coil springs were first tried having capacities ranging from 20 to 80 pounds. These were used with stream-line projectiles made of steel, aluminum and wood. A range of 50 yards was obtained with the best of these combinations using the spring in direct action. No greater range appeared practicable since the increase in spring strength was attended with increase in spring weight and the spring must be accelerated with the projectile.

A 1-inch steel ball must be given an initial muzzle velocity of approximately 100 feet per second for a range of 90 yards and the spring would not develop this energy without resorting to mechanical devices to multiply the spring action. Such a mechanism further complicated the mount and increased its bulk which must be held within the 7.2 inches spacing required in the specifications.

About the time the springs were proving their inability to meet the requirements, one of the large makers of air rifles was requested to study the application of its products, which it declined to do after some consideration.

About the same time a local company started experiments with compressed air using commercial air bottles similar to those found at soda fountains. Tests were conducted using stream-line bullets one-half inch and 1-inch diameter and of varying lengths up to approximately 3-inches and steel balls one-half inch and 1-inch diameter. The stream-line bullets were more costly than the balls and since there was no rifling in the bore, their form gave them no advantage in flight. A slight damage to the nose, the result of previous firing, often gave wide dispersion.

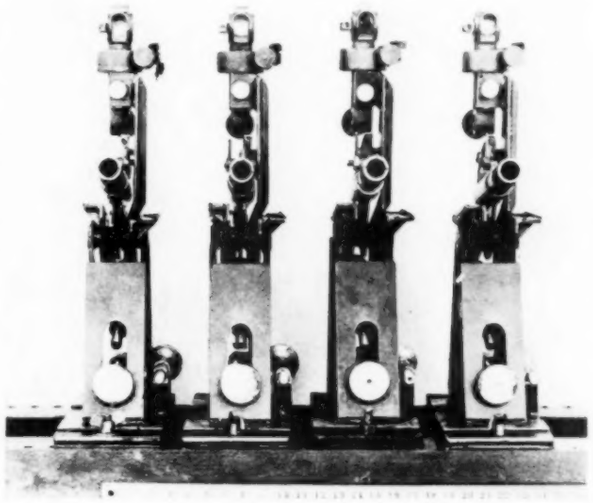
A few stream-line bullets 1-inch diameter were tried having fins that folded when in the bore, but came into action when the bullet was in flight. In the limited tests conducted with

*Chief Engineer and Ordnance Engineer, respectively, Artillery Division, Office of the Chief of Ordnance, Washington, D. C. Designers of the Field Artillery Trainer, M2.

these it was evident that they were not the answer to the projectile problem as the fins added considerably to the cost and were soon destroyed.

The air tanks supplied were charged at 1,500 pounds per square inch and since the pressure required to throw the 1-inch ball was approximately 125 pounds per square inch, an air reducing valve was required to compensate for this difference in pressure.

These, in addition to the air gage and tubes leading from the tank to the four mounts, together with the ingenious mechanism required at the gun to give a uniform discharge of air at the projectile and a prompt closing of the air line after the discharge, led to an unfavorable reaction toward this attempt to solve the problem. It was considered that the proposed device was too complicated and costly for the purpose.



A Battery of Field Artillery Trainers Mounted on Firing Base at 7.2-inch Interval.

HAVING abandoned the spring mechanism the Ordnance Office started experiments with caliber .22 blank ammunition. A low priced caliber .22 target rifle was modified, first by having the barrel shortened to about 6 inches in length. The remaining barrel was threaded for a length of 1-inch and a ½-inch brass tube 12-inches long was attached. The first experiments were conducted with aluminum darts having bullet-shaped heads ½-inch in diameter by 2-inches long and 3/16-inch aluminum stems of lengths varying from 6 to 12 inches. After the proper length of stem was determined, the desired range was obtained, but the results were very erratic as a slight bend in the stem or a light cross-wind caused wide dispersion.

The use of steel balls of ½-inch diameter gave considerably more range than required and the velocity was too great for satisfactory observation. New brass barrels having ⅝, ¾ and 1-inch diameters were tried. The 1-inch ball gave the most satisfactory results. It was visible in flight and it gave a very uniform range even in strong head and cross-winds. The larger balls were readily recovered and the size could be had commercially at reasonable cost.

Having obtained a gun, projectile and propellant that met the specifications, the next problem was to fire for a range table.

A suitable site was found at Fort Myer, Virginia, and the gun was mounted on a heavy machine gun tripod, elevation was set by quadrant at each 5 degrees of elevation up to 45 degrees and a group of shots fired at each elevation. Small pegs 1-inch square were driven into the ground with two inches exposed showing the range of each bullet. A number of these pegs were struck by bullets fired in the same group. From these firings a corrected range table was prepared which gave a surprisingly low dispersion.

WITH the completion of the range table came the development of a mount. Accuracy and size limitations were imposed by the specifications. The solution was further complicated by limitations of cost which of necessity was to be kept at a minimum in harmony with the times.

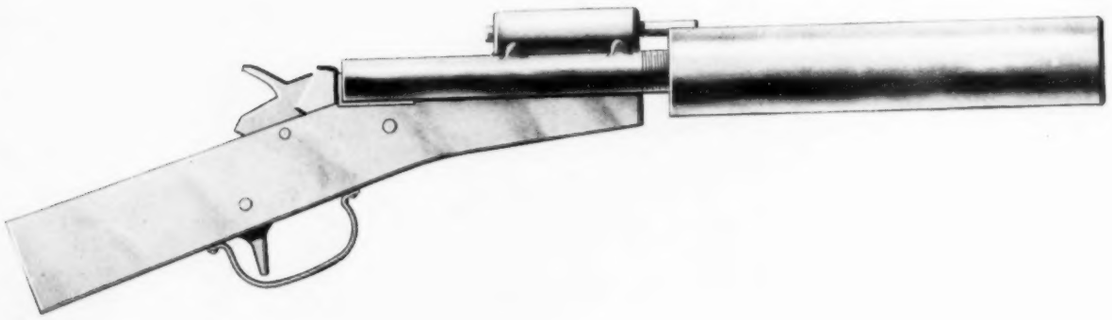
A number of studies were completed before the final layout was approved for the building of the first battery in May, 1933. This battery, known as Field Artillery Trainer, T5, with the necessary tools was manufactured at the Rock Island Arsenal in ten days and shipped to Washington for the inspection of the Ordnance Office and the Chief of Field Artillery.

Having met with general approval in Washington the battery was sent to the Field Artillery Board for test. After extensive firing by the Board a second battery, known as Field Artillery Trainer, T5E1, was manufactured to incorporate certain changes in detail to improve the ease of operation and to further reduce the cost of manufacture. The magnifying index on the range scale was found to be unnecessary and abandoned in favor of a plain index in the interest of economy.

The second battery was also sent to Fort Bragg for test by the Field Artillery Board and was approved and recommended to be adopted as a standard for manufacture for use by the Field Artillery in training. This recommendation has now been approved. The nomenclature has been changed to Field Artillery Trainer, M2. The first battery of Field Artillery Trainer, T5 was later issued to a battery at Fort Myer, Virginia, and has been demonstrated before the Army War College and many other interested officers in Washington.

A Battery of Trainers in Action Showing the Limits of Elevation and Traverse.

The cost of production has been reduced to a minimum by the use of malleable iron castings, interchangeability of parts in the pointing mechanism and by the elimination of refinements



The Rifle and 1-inch Barrel of the Field Artillery Trainer.

in parts not involved in the accuracy of the mount. The cost of a battery is approximately equal to that of three rounds fired by a battery of 75-mm. guns.

The mount as approved possesses the desired elevation and traverse, it includes an angle-of-site rocker with seat for the panoramic sight and gunner's quadrant, provisions for quadrant reading on the elevating parts and a range scale graduated in yards which gives 1/100 the range of the 75-mm. service charge. Thus, the mount meets the specifications for the miniature gun in detail.

It has never been the thought in the minds of the sponsors of this trainer that it can take the place of service matériel in training an artillerist. "But only in war," as the *Army and Navy Register* of May 13, 1933, puts it, "is ammunition for the Field Artillery available in sufficient quantity to produce efficient field artillerists and then only at enormous expense.

"With this apparatus an officer may not only 'prove' his firing data, practice all the mental gymnastics required in effecting an adjustment on his target, but actually fire for effect—the latter was never possible, except on the battlefield, due to ammunition limitations. He may also practice 'sweeps' and 'barrages'—methods of fire heretofore interdicted by ammunition allowances.

"While nothing but the firing of service ammunition will make a real artillerist, it is felt that this apparatus will bring an officer to that stage fully equipped to prepare to correct data and go through the operations of adjustment with a confidence that has been sadly lacking in the past. It will also serve to keep alive firing proficiency during these lean years when little or no service ammunition is available."

Only Real Batteries with Real Ammunition Can Give Adequate Artillery Training.

"It has never been thought in the minds of the sponsors of the trainer that it can take the place of service matériel in training an artillerist."

The Broad Arrow

Origin and Use of the Ordnance Mark of Serviceability

By O. F. G. Hogg*

THE marking of persons or objects to signify their exclusiveness, to indicate that they were the property of others, is an age-old custom in the history of the world. The practice was probably coeval with the birth of symbolism itself, that art which, from time immemorial, has universally persisted through savagery and culture down to our own era. Nations have passed away, empires have crumbled and religions have decayed, but their carefully chosen symbols, designed to denote some quality or belief, still exist. In many cases the emblem alone has remained, the reason for its shape and the nature of its origin having become lost with the passing of the years. At its inception, however, every ideograph expressed the idea it sought to convey, and many, being cosmic in character, have followed religious or astronomical lines, portraying for the initiated some aspect of the Logos.

The Broad Arrow—the crown mark of munitions of war—is no exception to this rule. It has evolved through storm and shine to its present status suffering, in common with other signs, some degradation in meaning. This fate eventually overtakes every religious symbol for the sentence. "Every religious mystery has its degraded shadow because the gods of today become the devils of tomorrow" reveals nothing less than the truth.

Many references to the sealing of persons with a special mark are found in the Bible. In Genesis IV. 15 we are told that "the Lord set a mark upon Cain lest any finding him should kill him." Again Ezekiel (IX. 4, 5, 6) and the Apocalypse (Revelation VII. 3, IX. 4, and XX. 4) speak of "sealing the servants of God in their foreheads." The second Beast, which came up out of the earth having two horns like a lamb and speaking like a dragon, had also a particular sign with which his adherents were to be blazed. From the writer using a word in the original text denoting "engraving" instead of "branding" it may be inferred that this badge of servitude was to be incised and not branded upon its recipients. Revelation XIII. 16, 17, informs us that "he caused all, both small and great, rich and poor, free and bond to receive a mark in their right hand or in their foreheads, and that no man might buy or sell, save he that had the mark, or the name of the beast, or the number of his name." The mark was the figure of the special symbol or attribute of the Power allegorized by the beast, the name was his own written out in full in some sacred language and the number was the more recondite way of expressing that name, either by a single numeral, as in the primitive Chaldean fashion, or by other letters taken kabbalistically and yielding the same sum.

A curious portion of the initiatory ceremony in the ancient mysteries was the giving of the "Mark of Mithras." After successfully undergoing each stage of the ordeal the accepted candidate was marked in a certain indelible manner. A similar system of caste-marks still prevails among the Hindus. Deva's mark, as borne upon their foreheads by Parvati's sectaries, is formed by three strokes, the two outside white or yellow and the inner one always red. It is interpreted as meaning the womb of Bhavani whence proceeded all that exists. The marking of certain individuals is very wide spread amongst numerous primitive races at the present day, tribal marks and totems being almost universal in their application from the basking tropics to the frozen north.

There is, therefore, some special significance attached to this ceremony which in all cases indicates that the recipient is segregated, placed into a class apart or specially appointed as being acceptable for a certain service. In a similar manner ♀ the astronomical sign for Venus sometimes known as the looking-glass of the goddess, was, as a sign denoting fertility, placed on the hind quarters of valuable brood mares of Corinthian and other beautiful breeds of horses.

THE Broad Arrow, in common with other triadic sigils, such as the Delphic E which if placed horizontally becomes the sign of Vishnu, the Hebrew letter shin, the Indian trisula, the *fleur-de-lis,* Poseidon's trident and the Prince of Wales' feathers, is usually derived, and it must be admitted with justice, from the fundamental fact of existence, namely the power to create, or, to express it in more philosophic language, the inherent power of a diety to manifest. From this conception, forged out in the mind of primitive man, arose the idea of a trinity. It is obvious that the prophet of old or the untutored savage, musing on the problem of being, would be forcibly struck by the creative potency of nature. He beheld it in the dawn of every new day; he saw it in the rotation of the crops and, if he were in Egypt, he could not fail to sense its utility in the periodic flooding of the Nile. He was familiar with it also in his household and amongst his flocks. Storms, disease and death he also knew; this was the reverse side of the medal, the delineation of the wrath of his gods for some supposed offense. Life and existence, however, depended upon the beneficence conferred upon him when, to his limited intelligence, his deity assumed the highest function, namely, the rôle of creator.

Since the human mind is only capable of framing a symbol in physical terms the union of the sexes appeared to our ancestors as the most appropriate method of representing this God-like attribute, and thus we get from the sage of Greece the exalted idea of the Decad or Divine number of the Pythagorians, from the teachers of India the linga and the yoni, from the Israelites, their Holy of Holies, and from the aboriginal tribes their fire-sticks in common with many other esoteric mysteries from divers lands. These multitudinous similes ranged from the loftiest conceptions to the merest phallic crudities according to the racial development of the peoples who sponsored them, but they all enshrined the same basic idea and were made up, in some form or another, of the pillar or stroke and the circle or the oval. These characters may be taken to illustrate the numeral 10, to connote the upright and the circle, to picture 10, the moon in Greek mythology or to depict IU, the ever coming One in Egyptian eschatology. When the latter comes the promise has been fulfilled, creation has taken place; and with the offspring, a trinity has come into being. The IU may now be written 𐤉𐤅

*Major, Royal Artillery, British Army.

and the incipient outline of all triadic marks, including that of an inverted broad arrow, gradually swims into ken.

Soon after such an emergence differentiation between these similar devices set in and their discovery in various localities long anterior to the Christian era is evidence of their individual existence.

Upon the ebony label discovered by Sir Flinders Petrie at Abydos in the tomb of Menes, the first dynastic Pharoah of Egypt, appears the representation of a broad arrow. This hieroglyph, which evolved from a Sumerian pictograph, occurs in the sentence recording the death of the king, its phonetic value being "Ma." This symbol, both in its Sumerian and Egyptian meanings, signified *truth, correctness, uprightness,* etc., and thus has borne its present meaning for at least 5,000 years.

C. W. King in his "Gnostics and their remains" quotes the case of a fine Abraxas gem of red jasper engraved on its convex face with the figure of Abraxas holding whip and shield, whilst on the reverse side, which is almost flat, is carved the Chnuphis serpent erect, with the Seven Vowels inserted between the rays of his head. Around the edge runs, amongst other lettering, a certain circular row of signs containing examples of the broad arrow as now emblazoned. This same sign has also been discovered as a mason's mark upon old buildings.

THE Broad Arrow developed through the Egyptian Tau, the crux ansata, and its closely allied symbol, the Ankh, which signified life in its deepest sense and therefore represented the Deity. This was the highest conception imaginable, for the winged solar disc was the image of Ra, the Solar Logos. The Tau therefore indicated the acme of perfection.

These symbols represented the ever-living principle, the Word made manifest, and were used to denote the king on the theory that the sovereign being an incarnation of the Deity, holds his sceptre by divine right and never dies. *Le roi est mort, vive le roi.* Thus the Tau became a royal mark, a signature of the ruling authority. Owing to the heir-apparent, the child in the Trinity being a connecting link in the ruling chain—for in the Courts of Memphis and Thebes the next in succession was always considered as much a part of the regnant power as the Pharoah himself—this mark became associated with the Prince, the child of promise. It thus bears a special affinity to the Prince of Wales' feathers, a symbol wide-spread in its adoption.

Another form of the same symbol is the Cyfriu sign of the Barddas wherein we are told that their Abcedilros or alphabet of ten letters was derived from the creative name Iau (in Greek Io, in Egyptian Iu and in Manx Ie), the ever-coming one, identified in early religious symbology with the moon, i. e., the wanderer through the heavens; hence the fable of the Wandering Ju or Jew. The Cyfriu sign, shown thus ↑, was called the sacred symbol of the unutterable name of God in Druidic lore and corresponded with the Hebrew Jah. It is identical with the "Three Shouts" of the early British, the A.1. at Lloyds and probably with the "Three Lights" of the Chinese, since all owe their origin to the same fundamental idea of the triadic form of the biune One.

The pheon, a charge in heraldry, is an arrow head engrailed on its inner edges, but when depicted on a coat without this peculiarity it is termed a broad arrow although such a distinction is not very rigidly adhered to. Instances of this charge are common and may be seen in the arms of Foster, Lowndes, Smith, etc. The armorial bearings of the latter family not only depict 4 pheons in saltire points to the center, but the description of the accompanying crest reads:

"Upon a wreath of the colours on a Roman fasces, a pheon point upwards or, between two laurel-branches fructed proper"; in other words a typical broad arrow with inner engrailed edges.

The famous house in history which bore this device upon its shield was that of the Sidneys, the head of which became the Earl of Leicester. The Sidneys of Penhurst gave many sons in service to the State and two of them particularly were associated with Government provision, namely, Sir Philip Sidney, Joint Master of the Ordnance in 1585-6 and Henry 1st Earl of Romney, Master-General from 1693 to 1702. Their coat-of-arms or, a pheon's head asure, led Fox-Davies, the learned author of the "Art of Heraldry," to infer that as the Broad Arrow was not a Crown badge in any degree "one of the Sydney family, when Master of the Ordnance, to prevent disputes as to the stores for which he was responsible, marked everything with its private badge of the Broad Arrow; and this private badge has ever since remained in constant use."

Since, however, the pheon was not peculiar to the Sidneys and since the Broad Arrow is shown not only to have existed as a royal mark in ancient times, but also to have served as a King's cypher in England anterior to the appointment of Sir Philip Sidney, this inference appears to have little or no foundation in fact.

So far as is known the original authority for inscribing the Broad Arrow on Crown property is undiscovered and no writ is extant to proclaim the Royal pleasure in this respect. The earliest mention appears to be in the records of the City of London which state that in 1386 a man was arraigned before the Lord Mayor and Aldermen assembled for having visited the houses of several brewers, under the pretence of being a King's Officer and a taker of ale for the Royal household. There he marked several barrels with an "Arrowhede" stating that they were for the King's household, when in reality he was a rogue who had received certain sums of money from the brewers in order that they might have the ale in peace. He admitted his guilt and was sentenced to be put in pillory for an hour. There is also mention in 1598 of the Broad Arrow being used by the Collector of Customs at Newcastle as a mark for contraband goods seized by him.

THE earliest trace of the Broad Arrow in connection with munitions occurs in 1553-4 when Sir Thomas Gresham, founder of the Royal Exchange, was smuggling gunpowder into England. Writing from Antwerp to the Council he mentions "giving your Lordships to understand that I have this day received 36 barrels of gunpowder, part of the complement that was lent to the Regent, which I have shipped in an English crayer, Mr. Thomas Spache of Lye, under this mark (↑) in the margin, the weight thereof you shall receive by the ship, and for the rest as it can be made, so it shall be delivered with as much expedition as may be." And again in the next year, writing from Seville, he refers to cases marked with the "brod arrow."

The first ordinance establishing a crown mark appeared in the reign of Charles I. The mark was instituted to prevent illegal traffic in arms and henceforward it was appointed that all muskets and other weapons issued from his Majesty's stores for land or sea service were to be stamped or engraved with the mark as enjoined in the ensuing order of the King.

ORDER FOR ESTABLISHING A CROWN MARK[1]

The King's Most Excellent Majestie, taking into his princely consideration the frequent abuses complained of by the Officers of His Majestie's Armorie and Stores, as well in purloyning as in chopping and chaunging of Armes delivered out of his Stores for Land and Sea Service;

And likewise being informed of an abuse no less frequent at musters and trainings in all the counties of these our Realms and Dominions, as well by borrowing Armes of the several Counties one from another, as also by borrowing Armes of the several Divisions in each County, one from another, by means whereof His Majestie's honour and service are much impaired, and the safety and defence of his Kingdom and people may be much endangered for want of necessary Armes and Munitions upon any sudden occurrence;

His Majestie therefore, for a timely remedy thereof, and for the preventing of the like in the future, hath, by the advice of his Privy Council, thought fit and appointed that all muskets, and other Armes, to be henceforth issued out of His Majestie's Stores for Land Service, shall be marked with the mark of C. R., and for Sea Service with the mark of C. R. and an anchor.

AND His Majestie doth hereby strictly charge, prohibit and command that no person or persons whatsoever shall hereafter presume, attempt, or go about to sell or buy any of His Majestie's Armes or Munitions, whatsoever, upon pain of incurring His Majestie's high displeasure, and the severest punishments that by the Laws and Statutes of this His Majestie's Realm of England, or by His Majestie's Prerogative Royal, can or may be inflicted upon the offenders for their contempt and disobedience in this behalf.

And to the intent that the said abuse of borrowing Armes, either by several Counties, or by several Divisions in one and the same County, may likewise be prevented, His Majestie's express pleasure is, and he doth hereby straightly charge and command, that no person or persons whatsoever shall hereafter borrow any Armes or Munitions to be used or employed at any public musters, or any trainings in any County, or Division of County, of this His Majestie's Realm of England, or Dominion of Wales; but that every person and persons shall from time to time furnish him and themselves with such Armour, Weapons and Munitions as is or shall be by the Lords-Lieutenant and Deputy-Lieutenants of each County respectively appointed and assessed.

And for the better effecting hereof, His Majesty doth hereby charge and command the said Lords-Lieutenant and Deputy-Lieutenants of each County respectively, to cause a separate distinct mark to be set and stamped upon all the Armes of each Company, whereby the same may be distinguished from the Armes of other Companies, and likewise to cause several distinct marks to be stampt upon the Armes of the several Divisions and Bands of each Company, whereby the Armes of one Division and Band may be known from another, that thereby all parts of these His Majestie's Realm and Dominions may be fitly and sufficiently stored with Armes and Munitions, both for offence and defence, as occasion shall require.

And His Majestie doth hereby charge and command as well all Officers of His Majestie's Ordnance and Armoury for that which concerneth them, as all Lords Lieutenant and Deputy-Lieutenants and all others to whom it shall or may appertain to take special care to see this His Majestie's pleasure put in due excution accordingly.

Given at His Majestie's Court at Whitehall, this 9th day of March, A. D. 1627.

A ROYAL COMMISSION appointed in 1633 was directed to mark all small arms and armor with the letter A. and a crown, the hall-mark of the Company of Armourers of London.

The first connection between the Broad Arrow and the Royal Mark seems to be found in a document bearing the date 1587. "The buttings and boundaries of His Majesty's Tower ground, called the old Artillery ground are as followeth. . . . Upon all which Boundary Houses, his Majesty's Tower Mark, the Broad Arrow by his late Majesty's special command hath, ever since the building thereupon, been set up.[2] Presumably therefore the Broad Arrow was officially introduced as a Government mark about the time that Charles II reconstituted the Board of Ordnance in 1683.

The last order on the subject necessary to quote is dated 28th July, 1806, and reads as follows: "The Board having been pleased to direct that in future all descriptions of Ordnance Stores should be marked with the Broad Arrow as soon as they shall have been received as fit for His Majesty's Service; all Storekeepers and Deputy Storekeepers and others are desired to cause this order to be accordingly attended to, in the Department under their direction, reporting to the Board in all cases where articles are received to which the mark cannot be applied." Henceforward all stores which could be so marked were inscribed with B ↑ O, a symbol which lasted till 25th May, 1855, when the Board of Ordnance was abolished. Since that date stores for Army purposes have borne the mark W ↑ D.

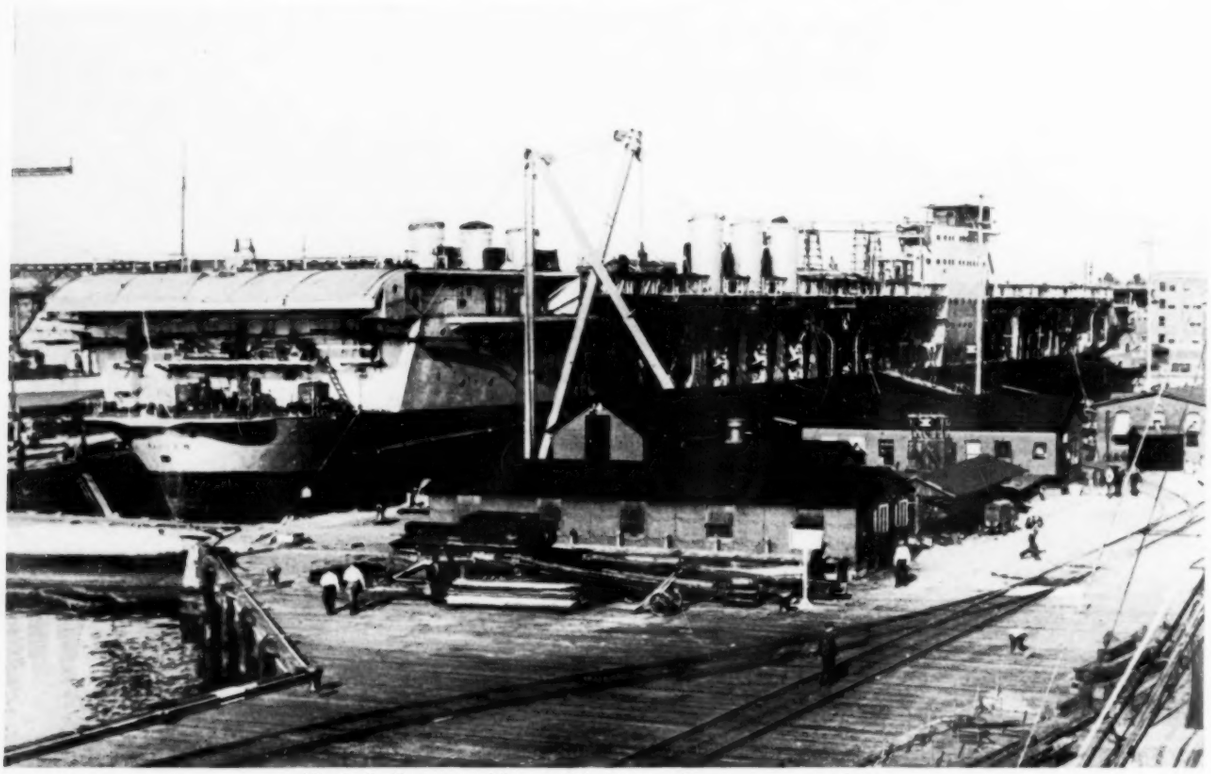
Although in course of time, particularly in regard to general stores where proof or test is not ordinarily required, the Broad Arrow has become to be regarded as a mark denoting Government property, it is clear that such a meaning is purely secondary. According to its mythological meaning, the ordinances quoted and the constitutional practice of the Board of Ordnance its primary and correct meaning is a hall-mark of serviceability, a guarantee of fitness for use. The secondary meaning was logically bound to follow as presumably no Government would retain an unserviceable store in its possession. It is, however, necessary to stress this distinction in order to prevent misunderstandings which may otherwise arise. The late Major-General A. Forbes in his "History of the Army Ordnance Services" appears to have fallen into this error when he states that ". . . lastly comes the use of the Broad Arrow as a mark of munitions, the most jealously safeguarded of all Crown property, and now in the care of the Royal Army Ordnance Corps," for history tells us that the mark was in the custody of the surveyor and not in that of the storekeeper.

Such then is the history of the Broad Arrow. Unlike most symbols it has retained throughout the course of centuries its pristine meaning, namely, the acme of perfection. Degradation from its prototype—the Tau—has followed in as much as a mark originally divine has become royal, but when it is remembered that in early times the King betokened on earth the invisible God in the Heavens, it will be seen that the idea underlying it has remained unchanged throughout the course of the many eventful centuries of its existence.

[1] 18 Rhym. Foed., p. 978.

[2] *Journal of the Society of Army Historical Research*, Vol. I p. 225.

News and Views of National Defense



U. S. S. RANGER—NEWEST AIRCRAFT CARRIER OF THE NAVY.

As the finishing touches are completed in drydock at Newport News, Va., the Ranger has more than an acre of landing deck to accommodate her one hundred and forty fighting planes.

POLISH LANCERS ON REVIEW.

With colorful pennants swinging to the breeze the Lancers are shown riding through the market square in historic Krakow during a recent review by Marshal Pilsudski, organizer of the Polish Army.

ARMY ORDNANCE

Published Bimonthly by
THE ARMY ORDNANCE ASSOCIATION
WASHINGTON, D. C.

NOVEMBER-DECEMBER, 1933

Month by Month

THE first signs of the beginning of the motorization and mechanization program for the Army under the Public Works Administration have made their appearance. On October 21st the Administrator of Public Works announced that $10,000,000 had been authorized for Army motorization and $15,000,000 for Army and Navy aircraft. This is the start of what is hoped to be ultimately a real program of modernization of Army matériel. The Army is firmly in back of the program for motorization and mechanization and its friends hope that the more comprehensive plan will be authorized soon.

FOR NON-COMBAT MOTOR VEHICLES

There is every reason, as we have said time and again in these pages, why the motorization and mechanization projects should be gotten under way. It is perfectly clear that they accomplish the aims of the public works program and that they make possible the crying need of the Army for modernization of equipment. They have nothing whatever to do with rearmament or an armament building program or anything like an armament race with anybody. When it is said that the mechanization and motorization provided for in the National Industrial Recovery Act do not mean an increase of our armament that is the plain truth. All that is wanted is modernization—not augmentation. The motorization and mechanization program will merely replace obsolete and obsolescent designs with their modern successors. These first allotments of $10,000,000 for Army motorization and $7,500,000 for Army aircraft are a small part of the $90,000,000 the Army has requested for this purpose.

In announcing these allotments the Administration of Public Works stated that the motorization allotment "aids the Army program of substituting motor power for horse and mule power in non-combat service work." Subsequently it was announced by both the Army and Navy that an agreement had been reached to divide the $15,000,000 allotment for aircraft share and share alike between the two services.

At least this motorization allotment is a beginning even though it is restricted to vehicles for non-combat purposes. Exactly what types of vehicles are to be included in the term "non-combat" at this writing has not been determined. Upon this determination will depend whether Field Artillery or Infantry vehicles will be replaced. Should the interpretation of the Public Works Administration be that the money is not to be expended on Field Artillery vehicles it is understood that tentative plans of the War Department include complete motorization of field trains of Infantry divisions of the Regular Army and motorization of about half of the field trains of Infantry divisions of the National Guard. If the interpretation is that the money can be used for Field Artillery then, it is understood, that motorization of brigade headquarters batteries, regimental headquarters batteries and all service batteries will proceed. We need these types of equipment as badly as we need the trucks and tractors and without them our military force will be deficient. Then too, combat vehicles will put men to work just as rapidly as will the non-combat kind. The Administration has done a great piece of work in getting the Navy back on its feet after years of disintegration. A sound view of the military problem will do the same thing for the Army and there is ample evidence that the Commander-in-Chief is for efficient, modern military equipment. Non-combat motor vehicles are a good start.

THE War Department has prepared and the Administration of Public Works has submitted to the President a modest supplementary building plan known as the technical construction program. As the title indicates, the program refers to buildings urgently needed by the several supply services of the Army. These include permanent structures to replace temporary buildings which have been doing duty since World War days and before. Arsenals and depots of the Ordnance Department are included in the program and comprise one of the most important parts of it. The program is entirely one of reconditioning and replacement; it does not provide for increase of facilities or of housing. Every one familiar with the technical problems and achievements of the Army will join in the hope that the program will be approved. It is urgently necessary to the national defense and it is another worthy means for the relief of unemployment through public works. It is understood that the program asks for some $26,000,000, approximately $10,000,000 of which is for Ordnance establishments. Of this latter amount approximately $7,500,000 is for technical buildings, facilities and equipment; the balance, approximately $2,500,000, is for housing.

TECHNICAL BUILDING PROGRAM

True it is that an allotment of some $54,000,000 already has been made to the Army for building construction but all of this is to be expended on the larger line posts of the Army. The technical construction program will provide quarters for personnel, other buildings and utilities at the stations of the technical and supply branches. Both the men and the machines are the essential parts of any efficient organization and both should be provided for properly and substantially. The value of the investment is in proportion to the living comfort of personnel and the operating and storage efficiency of matériel. The two go hand in hand.

All the technical services of the Army require this perma-

nent construction at depots and plants under their control. Our familiarity with these needs is based on a knowledge of the situation at some of the Ordnance establishments so we can speak mainly of them. The same conditions exist at many other technical stations and the same urgency for relief follows. Come what will as to the projected scheme for regrouping the Army, the Ordnance establishments must carry on no matter how the regrouping results. The Army must have its arsenals, its storage depots and its repair centers just as it must have its hospitals. So no change of policy which may contract the location of our widely expanded military organization will effect a technical construction program one way or the other. A look at some of our Ordnance establishments and one will wonder how under the sun (literally and metaphorically) some of them can hold out much longer. Their aggregations of buildings, hastily erected in 1918, began long ago to show the effects of age. These structures, many of them at least, are of a type which in commercial life would have been scrapped years back. But the Army has been living on a lean diet, even the paint brush had to be spared where new construction already was obviously needed. As a case in point, we recall an incident of some eight or nine years ago when money generally was easy—when all the boys were spending rather freely if not quite as grotesquely as they did in 1928–1929. Money was not easy for the Army even in those days. We happened to drop in at the Aberdeen Proving Ground and discovered that *half* of the Administration Building had been painted. The other half, we were told, would have to wait; there wasn't money enough to paint the entire frame structure that year and there might not be for the other half during the next year. That is the kind of thing the Army has put up with at many technical establishments for a long while. Temporary buildings which house some of the activities of a highly scientific and a highly important type have gotten to the point where there is no alternative at all, they should come down and new permanent structures erected in their place.

The wisdom of building wisely is shown at Army plants no less than in commercial establishments. Anyone who has ever visited the Rock Island Arsenal and some of the other older Ordnance stations will understand that readily. Rock Island is well known as a star example of what arsenal construction should be. It too has some temporary World War structures still standing; it does not have sufficient officers' quarters but, in the main, its permanent buildings are evidence of sound policy. Even at depreciated values it represents an investment of about $37,000,000, containing stores and equipment valued at some $225,000,000. And it has earned its keep many times over. It has been in existence since 1862; today it is a model of permanency.

Many of the newer Ordnance establishments have not been so fortunate either as to quarters for personnel or buildings for normal peace-time operations. We could begin with Aberdeen and go down the line including arsenals, storage depots, maintenance and repair depots and the rest. Some of them need officers' quarters, others barracks, others hospitals; some need warehouses, others roads, others rehabilitation of permanent structures. Many of these stations, particularly the ammunition depots, being of war-time construction are simply a collection of temporary frame buildings of expensive upkeep and with few, if any, remaining years of usable life. And all of them are necessary.

The approval of this technical building program by the President will be a real step in the direction of efficiency and economy. Men can be put to work at once on it. When the task is finished the technical services of the military organization will be permanently housed, the handicaps of inadequate buildings will disappear. The sooner hollow tile and concrete replace cardboard and tar paper at our arsenals and depots the more efficient will our Army be. And to allay the fears of those who may imagine that this program provides for expanding the Army in one way or another let it be said again that it is pure and simple replacement and rehabilitation. It will take officers of the technical services out of the shacks they have lived in these many post-war years and it will replace the delapidated sheds, the leaky shops and the weather-beaten storehouses with permanent structures befitting the purpose for which they are required.

The Field Artillery Trainer

THE Field Artillery trainer, described by its designers Messrs. Gurney and Conlon of the engineering staff of the Ordnance Department in this issue of Army Ordnance, may cause some old-timers to rub their eyes and inquire whether our miniature Army has developed such a miniature complex that hereafter it will train with miniature guns. At first blush it might seem so, but the trainer is forced on the Army by circumstance and is not claimed by any of its sponsors to be a substitute for a man-size gun firing man-size ammunition. On the contrary it is merely the Army's answer to enforced economy all down the line. As long as our financial straits do not permit training our Field Artillery forces as they are accustomed to train, then this miniature weapon is the best answer for the present emergency. The training gun is the conception of General Bishop, Chief of Field Artillery. His fertile brain saw the need and the method for keeping Field Artillery personnel on their toes at a time when training allowances of ammunition are taboo. From General Bishop's thought the training gun was developed as we now have it designed by Messrs. Gurney and Conlon and manufactured by the Martin-Parry Corporation of York, Penna.

Obviously the real purpose of the trainer M1 is not to supplant training allowances of ammunition for all time. These allowances today are meager, the national pocketbook is thin, and the chances of replenishing war reserve ammunition which might be fired for training are slim. Lest any observers feel that our Army has taken up the use of miniatures in its practice exercises and that ultimately perhaps miniature tanks with spring and key may replace the man-sized article, it should be stressed that the training gun is only a stop-gap, the limited uses of which are well recognized by its sponsors. General Bishop, father of the trainer, has said, "Nothing can take the place of service practice with live ammunition in the training of our Field Artillery."

There are two problems connected with the use of the trainer which students of national defense will not overlook. The first is the importance of a reserve of ammunition. Every shell that is fired away in peace time may reduce the factor of safety in time of war. Ammunition, as is well known, has a normal life. It might be concluded that if the ammunition will deteriorate it might just as well be used in practice. But the statement is only a half truth. It is the explosive filling of the ammunition which deteriorates and the success

of recent renovation operations by the Ordnance Department has shown that the metal parts can be reclaimed and refilled so that their value at least is salvaged.

The second problem is in the training of personnel in the use of equipment. This trainer is really for the purpose of mastering technique of adjustment and that is about as far as it can go as a substitute for a real gun and a real projectile. No one will claim more for it. It appears to be a very worthy temporary expedient with emphasis upon "temporary" and "expedient." If anyone thinks, however, that actual maneuver can be replaced by such a device as this the conclusion is erroneous. No such claim is made for the Field Artillery trainer. Toy soldiers are all right as far as they go but only the drill sergeant barking out to squads in the flesh can produce the perfectly trained soldier. Under the circumstances the Field Artillery trainer will serve its purpose. It is good enough to pass muster in these days of necessary economy but no one claims that its advent means that our caissons no longer go rolling along.

If, however, it becomes a habit to drop down to miniature weapons, regardless of their efficiency for training purposes, the situation would be bad all around. The next step might be miniature tanks and then miniature airplanes so that ultimately we might be ready to repulse only invading pigmies or a landing party of cretins!

"No Soldier Would Start a New War"

General Max Weygand says "No soldier would start a new war." He knows whereof he speaks. Being the head of the French Army he is vice-president of the Supreme War Council of France. With Marshals Foch and Petain, he worked out the program of fortification for the French frontier scheduled to be completed next year. Marshal Foch, just before his death, said "If military peril menaces France when I am no longer here call on Weygand and you can be tranquil." Among all military men in active service today General Weygand's outlook and opinion are of the first rank. He proves again that the making of war for war's sake is not the desire of the soldier.

From across those French frontier fortifications—remarkable examples of military engineering—comes word from another great World War general, President von Hindenburg, the former Field Marshal. Speaking on the eve of the Nazi election he assured his fellow countrymen that, having fought in three campaigns, he wanted no new war.

These expressions of fighting generals serve to focus current attention on an historic fact—often overlooked. It is not the soldier who wants war or who makes it. His principal concern is to be ready for it whenever it comes and to get it over with victoriously and as speedily as he can. He is like the guardian of the peace who, having no desire to use his night stick, when circumstances require he has a good night stick in his belt. We in the United States have a tradition for which we should be grateful—our military and naval services have nothing whatever to do with deciding whether there shall be a war or not. Theirs is not the responsibility of deciding. That responsibility resides only in the people themselves who, too infrequently, do not know the full significance of the duty. If it rested entirely with the soldier we could depend that there would be less flying-off the handle at the drop of the hat. General Weygand speaks for soldiers everywhere—and for those civilians who really know what modern war waging really is—when he lays down his all-inclusive premise. Coming down to historic fact—the cases are few where soldiers have started the wars. On the contrary soldiers have come into the picture when the bungling statesmen have finally had to show their hands. That's where trouble, in nine cases out of ten, actually starts. It is the unpleasant task of the soldier to put the finishing touches to it. Habitual critics of our national defense would do well to remember the conditions which prevail in our country in these days when international horse traders are again rocking the boat.

Good Work, General MacArthur!

General Douglas MacArthur during his incumbency as Chief of Staff of the Army has done such a magnificent piece of work for the military establishment that we take this opportunity, coincident with the completion of three years of his service in that high office, to join with all other friends of national defense in congratulations to him and to the Army. Everyone who has observed the skillful and untiring way he has carried the many burdens with which the Army has been faced since the very days he assumed his office is familiar with the magnitude of the problems he has coped with. The harder the task, it seems, the greater leaven of common sense and perseverance he gives it.

The problems of the last three years have been gigantic ones for the Army as they have been for every other organization and individual without exception. Upon General MacArthur's shoulders have fallen many of the burdens of the day and the heats and he has emerged from them with colors flying. To the momentous questions of the present and those yet to come he may be depended upon to stick to his guns. The Army is indeed fortunate in having a man of his knowledge, experience and zeal as its military guide and adviser to the civilian heads.

In recalling some of the things for which the Chief of Staff can take to himself a goodly measure of well-merited congratulation, students of military affairs will not overlook several milestones in the peace-time advancement of the Army. Notable among these are the studies begun with General MacArthur's presentation of recommendations to the War Policies Commission in 1930 which have finally emerged in the Mobilization Plan, 1933, as approved by the Secretaries of War and Navy. Against great odds, it was General MacArthur who saved the cadre of officer strength when Congressional opponents were bent upon crucifying the National Defense Act of 1920. Add to these the sound tactical principles that have become Army policies during the past three years and the success thus far of the program for rehabilitating the Army with Public Works funds and we have ample evidence of the soundness of the MacArthur doctrines. He has given more than his share of tremendously valuable leadership. We salute him and the Army whose good fortune it is to have him as its military head.

The new civilian heads of the Department were faced with unusual problems and have been since they assumed office last March. They have risen to the occasion in splendid fashion. Secretary Dern and Assistant Secretary Woodring have in General MacArthur an adviser and administrator whom the Army and its friends respect, admire and applaud.

NRA AND WAR CAPACITY

AN editorial note in these columns of the last issue entitled, "The Changing Industrial Order" evoked the following comment from Lieut. Col. R. D. Coombs, Ord. Res., who is assigned to the New York Ordnance District:

"The editorial on page 104 of the September-October issue regarding the effect of the NRA (NIRA) on industrial preparedness seems to the writer to include an indorsement of the idea now fashionable in governmental circles that the whole industrial structure is to be permanently and greatly revised. You seem to infer that all or most of the smaller concerns will be wiped out and that the War Department will have to deal only with a few vertical trusts. Further, that since the government will already have continuously up-to-date reports on everything that industry has and does that allocation of production will be almost automatic.

"Apart from the fact that I am one of those who hope the above is entirely wrong as a prophesy, I am not so sure that it would be a great help. If this idealistic—controlled—socialism has even a temporary success will we not be shy a large part of the needed war capacity? The work for preparedness is difficult enough without compelling a choice between it and certain political economic theories. The only saving grace some of us have is that in the absence of a declaration of war we need not agree with the national administration."

We regret that the editorial referred to by Colonel Coombs created the impression "that the whole industrial structure is to be permanently and greatly revised" and "that all or most of the smaller concerns will be wiped out and that the War Department will have to deal only with a few vertical trusts." Its purpose was not to convey either inference. It was not intended as a hearty shake of the cold, clamy hand of bureaucracy nor an upholding of that hand when it takes undue prerogatives whether the emergency be the big bad wolf of depression or the bigger, worse specter of war.

The editorial, inasmuch as it lacked clarity on this point, may rightly be attributed to an overzealous regard for the certainty of industrial preparedness rather than a disregard of our time-tried methods of individualism in commerce, industry, engineering and the arts.

Thus, for clarity's sake, a restatement of the intended thought may be appropriate. NIRA (the law) and NRA (the method of the law's application) both have a significant bearing on industrial preparedness for the simple reason that the coördination they aim to effect is the same in principle, if not in some present phases of application, as the coördinating industrial boards of the World War. Consequently the task of industrial war planning would have under NRA a big jump on any coördinating measures which might be required in another national emergency. As to vertical trusts, the squeezing-out of the little fellow and any other possible outgrowth of misguided applications of regimented industry it was certainly not our purpose to indicate any measure of value so far as industrial preparedness is concerned. Individually the writer of these lines doesn't believe for an instant that the head of the National Recovery Administration and some of his deputies, especially those who lived through and directed industrial coördination in the World War have any bolshevik notions on the subject. On the contrary, codes of fair practice, as we understand them, may effect capacities and requirements of materials. As they do the surveys of our Ordnance Districts and of the entire planning organization may be affected. Hence, we reiterate the intended meaning in the first instance: Industrial surveys and contacts will have to be kept current. We still feel that they will and this is all that was meant to be stressed.

RED TAPE AND RAT TRAPS

PUBLICATION in the September-October issue of ARMY ORDNANCE of the article by Capt. Wayne W. Cowan entitled "Ordnance District Operation in War" has elicited quite an unusual amount of comment from our readers. Some have intimated that the charts published with this article indicate an excessive amount of red tape in the Ordnance war-time setup.

Red tape is one of those obnoxious terms for unnecessary, hidebound, detailed regulations which one encounters in nearly every large organization. It does not apply unless the regulations of themselves go into minute detail and prevent or delay the object in view. It goes without saying that any organization as large as the Ordnance program will entail in the event of war must have specific procedures for carrying on the work in hand. We are frank to say that where essential steps are indicated, such as in the Cowan charts, they are not red tape in any sense of the term. On the contrary they are essential steps such as our large and efficient industrial organizations today must have to control their work, assure production and distribution. Our Army has had its cudgel out for red tape since the World War and it has hewed to the bone. Today as compared, let us say, with the Spanish-American War period the situation is as different as day and night.

As an instance of what red tape really is we are taking the liberty of republishing an historic example from Maj. Gen. A. Forbes' "History of the Army Ordnance Services." It proves the point we feel.

Within 1000 miles of P—— was a store in which a large quantity of military clothing was kept, pending emergencies, and to keep down the rats there was a cat, for which a small subsistence allowance was drawn monthly. Retrenchment, however, was the order of the day, and the officer in charge was instructed to requisition "Traps, rat, wire, iron, galvanized, Mark I," in the proportion of one to every 100 suits of clothing. In the next "changes in war matériel" an elaborate picture and description of the above trap appeared, and the cat was declared obsolete, and was ordered to be handed over to the Commissariat Department to be sold. The number of traps, according to the above proportion, was found to be 19.3, and accordingly 20 traps were demanded. The requisition came back with one trap disallowed, but by way of consolation it was stated "that fractions of a trap exceeding .5 would be considered as a whole trap."

Thereupon the officer in charge of the clothing store pointed out that the odd 33 suits of clothing would be at the mercy of the rats, but without avail. The 19 traps duly arrived, and a return, Army Form X 1063, was ordered to be submitted monthly.

The return in question was arranged in birdcage form, and was a masterpiece of its kind, showing at a glance the amount of clothing in store, the cubic measurement of each room, the number of traps on hand, and the number of rats caught each day. Mice were to be shown under "Remarks."

The percentage of rats caught to suits of clothing, and of rats to traps, was to be noted marginally.

As it was feared that the officer in charge of the clothing store might endeavor to take credit for mice as rats, the measurements of the animals caught were ordered to be inserted, and the officer in charge was authorized to demand "a suitable service measuring rod for the purpose."

The officer in charge of the clothing store, anxious to show the keen interest he took in the matter, demanded "gauges, measuring cartridges and live shell," which would enable measurements to be taken to 1/1000 of an inch. The authorities pointed out, in reply, that these gauges were fitted with gun-metal screws, and were intended for measuring explosive articles only, "a condition *presumably* not applying to rats," that their use with articles of a non-explosive character would therefore be "highly irregular if not dangerous," and that the operation must in any case be carried out under magazine regulations with felt slippers in an isolated building 400 yards from a road. "A plan of the locality was to be submitted."

An application that the term "live shell" might be extended to include live rats was rejected, and it was suggested that an ordinary 2-foot rule would be sufficiently accurate for practical purposes. This was accordingly requisitioned, but elicited the reply that "these stores formed a part of chests, tool, carpenters', which were only allowed at stations for which carpenters' shops were authorized." A strong case was accordingly made for the erection of a carpenter's shop, which was sanctioned at a cost of some hundreds of pounds.

Meanwhile the officer in charge of the store acknowledged the receipt of the traps, and requested instructions as to how they were to be set. The reply came "that the matter had been under consideration, and instructions would shortly be published." The first monthly return showed several suits of clothing destroyed by rats. The authorities gave evidence of the energy they always display in an emergency, and a very complete pamphlet was issued within a month, in which the mining of the iron, drawing out into wire, method of galvanizing, manufacture into traps, and system of inspection, testing and passing into the service, were exhaustively dilated on and profusely illustrated. Nevertheless the second return was like the first.

The third return showed "rats caught *nil*," and more clothing destroyed.

A Mark II trap was introduced, which differed from Mark I in that the wire was not galvanized, and the iron was obtained in Germany. No rats were caught, and further destruction of clothing! None but men of superior intelligence were to be permitted to touch the traps, and a warrant officer was to be struck off duty and detailed to instruct them. A return was to be submitted monthly, showing the number of men instructed. In selecting the warrant officer the claims of a man who had caught bandicoots in India were ignored, and the opportunity of infusing fresh blood into this important service was neglected. The grievance was duly aired in a weekly contemporary.

The worthy soldier who was selected, elaborated a drill in accordance with "the spirit of the instructions," which, after various extensionary motions to develop the trap-setting muscles, commenced with "take up traps," and ended with "ease springs." Badges in gold and in worsted of crossed rats' tails were authorized for men who attained a certain stage of proficiency in trap-setting. Still no rats were caught, and the destruction of clothing continued in spite of these precautions.

"The return showing number of men instructed was to be submitted in duplicate once a week." Even this failed to produce an improvement.

The authorities were reluctantly compelled to admit "that the traps had not answered their expectations, and that there appeared to be no fault either in the traps themselves or the setting," and inquired incidentally "What bait was used?" The officer in charge of the clothing store pointed out that no allowance was made for bait in the regulations, and that he could not be expected to provide it out of his own pocket.

In the end the cat was reintroduced into service, and was "to be strictly adhered to for the purpose of catching rats." The traps were retained "for instructional purposes only."

MILITARY REPORTING

THE article "Cavalry 'Marches' on Wheels" by Lieut. Henry Cabot Lodge, Jr., Cav. Res., in this issue had its genesis in a splendid piece of military reporting by Lieutenant Lodge for the *New York Herald Tribune* last August. It was a good example of what military writing should be and again emphasized the scarcity of this kind of news writing in our daily press. We need more of it badly. It is not mere recitation of glamorous detail, the names of participating dignitaries, etc., that give value to the work of the military correspondent; on the contrary it is accurate narration with an understanding of the significance of the problem which makes the news story worth while.

Thus the whole theory of this Cavalry "march" is susceptible of descriptive treatment which enables the reader to get a good idea of what took place and why it did. For example, in the case of the Big Bend portée the moral is quite obvious. In a war of movement it is absolutely essential that attacking troops should approach the field of battle in the very best possible condition and with all their reserves of strength fresh and unexhausted. A man who is tired and exhausted cannot possibly exert the power and be as effective as the man who comes to battle fresh and strong. It is solely to insure this delivery of the maximum of power on the line of battle that the soldier is clothed, fed, housed and trained. If it be important that horses arrive at the scene of action as fresh as if they had been in stables, how much more important is it that men should arrive on the scene of action as fresh as if they had just stepped from their barracks.

This leads to the one conclusion that the whole Army should be completely motorized. The marching of Infantry with a pack weighing from fifty to sixty pounds on their backs is an anachronism. What apparently applies to the Cavalry certainly applies to Infantry for it still occupies the center of battle and still is equipped with weapons most destructive of human life, namely, the magazine rifle and machine gun. From the point of view of developing all the possibilities of mechanization the Army should be first completely motorized in order that all its units may be trained as far as possible in things mechanical.

These are the conclusions which the qualified observer will draw from the Big Bend portée. When Lieutenant Lodge described it for one of our large metropolitan dailies, and as he does again along slightly different lines in this issue of ARMY ORDNANCE, he is setting an example of military observation and reporting which the American reading public too infrequently has served to it and which we believe it wants.

Now for Repeal of Twaddle!

An Editorial

ALL of us know pretty well the meaning of repeal—goodly majorities in thirty-seven of our states have been thinking about it and acting on it these many months. Regardless of what is repealed we know that it means: to stop in our tracks, go back and undo a thing we feel should not have been done. Hereafter our morals will be gotten elsewhere than in the Constitution of the United States. We have decided to quit experimentation with constitutional temperance no matter how noble in motive; to get back to sound fundamentals. So we are clear on the meaning of repeal. "Twaddle" may call for some clarification, because it isn't used often. It sounds like a good old Anglo-Saxon word, a variant of "twattle." It means silly, weak talk. We preëmpt the meaning to apply to the words, words, words, on all sides, minimizing the need for adequate military and naval defense of the United States. While there is silly talk about many important things, none of it is quite so silly and no subject is quite so important as the twaddle about war and peace, the size of our Army, the morals of munitions makers, the building program of our Navy, and silliest of all, the responsibility of the United States for world-wide disarmament. By repeal of twaddle we mean simply this: it is time we repeal one more thing while we are about it; it is time to return to sane ideas and purposes on the whole subject of national defense; it is fitting to repeal the twaddle as the meaning is here preëmpted.

This does not mean that every one who does not see eye to eye with the believer in national defense should be silenced —far from it. It simply means that the undermining processes of some moralists, the impractical leadership of some internationalists, the unsound policies of some exaggerated nationalists, the mouthy frothings of some pacifists, the idle gibberish of some imperialists, and the too-dreamy hopes of some idealists—all this is twaddle and it would be well to repeal it now that we are in the repeal humor. It would be a great step in the cause of peace.

THE relation between the two subjects, prohibition and twaddle, is not as far-fetched as one would think on its face. The nature of the two things is admittedly not the same but the fervor, zeal and intensity of the two groups who favor these forms of uplift are similar. Frequently it is the same uplifters who hold aloft both banners. Generally they are the type of people who can be depended upon to confuse effects for causes. They could not distinguish between the use and abuse of alcohol, neither can they see a difference between the use and abuse of armament. So while we are repealing we might well tackle prohibition's twin brother, disarmament.

To offer a suggestion of this sort is not to open one's self to the charge of limiting free speech. People can be talked into war just as they can be talked into a 75-cent haircut. It is only when talk becomes idiotic that the urge to "crack down" on it has any pretense or justification in fact. And some of the disarmament talk has been most idiotic. It is a good thing to discuss all important questions pro and con provided, of course, that the talkers know what they are talking about. Most of the sponsors of disarmament, who are the parties to nearly all the talk on the subject of peace and war these days, have done more than their share of lambasting the good old United States. The Army is too big and too costly, so is the Navy.

Take the Geneva Disarmament Conference itself. It has been rightly called one of the most dangerous institutions to the peace of Europe and one which was corrupting international morals to a degree never before reached. Spokesmen for various interests were charged with the double responsibility not only of deceiving their own people but the representatives of some sixty odd foreign nations as well. Fellow members of the Conference had to be given the impression that there was the desire to disarm and the folks back home had to be given the same palliative in slightly different form. Thus it was that Article 8 of the Covenant of the League of Nations itself became the football of European politics. Germany was compelled to agree to a treaty limiting her land forces to 100,000, and the Germans at home were told that this was merely a preliminary step to world disarmament. This kind of talk officially resulted in the following statement: "The members of the League recognize that the maintenance of peace requires the reduction of national armaments to the lowest point consistent with safety." Which has turned out to be just plain talk, twaddle.

Then there were those loud-voiced individuals who made the plea, and talked themselves blue in the face over it, that all "aggressive weapons" be done away with. They talked at great length on the definition of "aggressor" and the definition of "an aggressive weapon" knowing full well that the former can seldom be defined when the war psychology is at work, and that the latter, "aggressive weapons," is mere twaddle. Writing in a recent issue of ARMY ORDNANCE on this subject, Maj. Gen. J. F. C. Fuller put the matter in a homely form when he wrote, "No one could call a table or a chair aggressive except perhaps in the meaning that it offends the eye; yet if I seize upon a chair and fell someone to the ground with it it is strictly true to say that the chair has been used in an aggressive way. The difference between a chair used as a weapon and a true weapon, such as a rifle, is the purpose underlying their manufacture, the one is made to sit on and the other to kill with. All weapons are made in order to develop lethal power, and this power may be used either offensively or protectively."

THEN there are folks like those who engineered the Conference against War at Columbia University on October 31. Dr. Butler's message to the conference said "It is becoming increasingly clear that one of the greatest obstacles to further progress toward international coöperation to establish and maintain the peace of the world is to be found in the activities and influence of those important and powerful groups in various countries whose interests lie in the manufacture and sale of munitions of war for private profit. The growing movement to make the manufacture of munitions of war a government monopoly will be greatly strengthened as public opinion comes to recognize the dangers of permitting the continuance of conditions under which zeal for private profit is free vigorously to oppose the highest public interest of the people of the world." At the same gathering Prof. Parker T. Moon, professor of international relations at Columbia, said

that "pious platitudes and sloppy sentiments would not end war." The present war system must be destroyed, he said, and "in its place a healthy internationalism expressing itself in effective institutions like the League of Nations and the World Court." Also at the same gathering, Earl Browder, secretary of the Communist party in the United States, predicted that the Roosevelt administration would lead the country into war in the near future. On Armistice day, according to the Associated Press, students from Smith, Mount Holyoke, Amherst and Massachusetts State College, bore in a parade at Northampton, Mass., a placard "NRA means nationalism and war."

The Columbia jamboree is a good example of the kind of twaddle to be repealed. Dr. Butler, who pioneered so splendidly for repeal of the Eighteenth Amendment, seems out of place when he takes his stand on munitions. He does not usually confuse effects for causes. He might have explained that here in the United States our government arsenals are the centers of manufacture and that they can make only about 8 per cent of our war requirements of guns and ammunition. He will have to be prepared to see our continental map dotted with government arsenals at billions of dollars of capital and operating cost if the government single handedly has to do the job in time of emergency.

Then there is the most foolish talk of it all like that gotten out in the six point program recently adopted by the International Consultative Group in Geneva, an outfit claiming to represent some hundreds of thousands of members of peace societies of the world—the type of folks who present books of signatures requiring a two-ton truck to haul them, such as the one prepared recently by World Peaceways. It weighed 2,330 pounds, measured 7½ feet high, 7½ feet wide and 3½ feet thick. It was "dedicated" in Union Square, New York City. Its title was "War—the Super Racket." It was called "A roaring, thundering demand for peace." They very foolishly rush in on subjects about which they know nothing. They talk about 155-mm. guns, bombing planes and tanks as though there were no experts, technical and tactical, on such subjects. That they are suffering from the same type of disease which produced the 18th Amendment is abundantly clear when these simple folks demand international supervision of the manufacture of arms, a plan which strikes directly at the United States for it must be remembered that under our National Defense Act the greater part of our defense is placed upon our peace-time industry and its preparedness to make the instruments of war when and only when needed.

THUS we have disarmament twaddlers who may be grouped into the officials with poker faces who usually have no hand to disguise, the theorists who usually know only theory and no practicality, and the uplifters who with the 18th Amendment long on the skids and now actually gone must find something to which their energy can be applied. They think they have found it in "the forrest of bayonets" in the United States.

Talk for talk's sake on any subject can do a great deal of harm. There is no disguising the fact that lovers of peace who have confused disarmament as the only road to stable peace have done the cause of peace no good. Any fair observer must admit that the cause of peace has suffered during the past ten years as it has not suffered before. And this has been mainly because peace has been talked to death in terms of armament. The probabilities and the inhumaneness of modern war have been emblazoned everywhere as though a permanent peace depends upon the range of a gun or the number of "effectives" a particular nation can muster.

As it is, the cause of peace like the cause of temperance has suffered severely in the very means proposed for assuring it. Prohibitionists got along with their enforcement plans in the heyday of American aridity by seizing upon the wickedness of the saloon. Under that label gullible people for a while were led to believe that repeal of the Eighteenth Amendment would make drunkards of us all. Now the armament phobia is taking up where prohibition left off. In the place of the wickedness of drink it has fallen upon the wickedness of armament. There is no such thing as a middle ground, the armament critics say, except in the form of an international police force—as though the very differences of race, of national resources, of cultural outlook were factors to be brushed aside and adequate national defense an evil in itself. These confused ideas have accomplished nothing practical, indeed they have done a degree of damage to be measured only by future events for it is a fact that despite the Treaty of Versailles the Protocal of Locarno, the Pact of Paris, world peace grows more unstable. Apparently it is a forgotten precept that lasting peace is something more than talk; it is a fact depending not on calibers, not on weights, not on ranges of weapons but on justice, charity and mercy. Until these qualities of soul prevail everywhere, twaddle in the United States should be repealed by general consent.

AFTER all, peace is a matter of the heart. The world will have it perpetually when the entire world's population in its hearts wants it, when justice and mercy replace injustice and fear. Until that day comes calibers of guns, weights of tanks, speeds of planes, make no difference whatever. General Fuller's chair will do, if it has to, to protect against the violation of rights. How much better it would be, how much more effective, if twaddle were repealed. Our people could go on their merry way with adequate, sensible measures of national defense as we generally have in this country, with malice toward none. The twaddlers then could get down to brass tacks and use their tireless energy on instilling principles of fair play among nations and among men—the only road to permanent peace.

In other ages there seemed to be more ground for the belief that fair play had come to stay. Now we are to believe, on the word of the twaddlers, that men and nations have been reformed and that armament is the cause of all the trouble. May we take the liberty of reminding these good folks that armament is only a symptom, it is an effect, not a cause. May we respectfully recommend to the twaddlers that they concentrate their energies where they may get at causes, that they cure the disease and the symptoms will soon disappear. The effort would be well worth while. Should they accept the advice—but in all probability, they won't—at least in their twaddle they might have the graciousness and regard for the truth to emphasize that the United States is not afflicted by an exaggerated nationalism, that its armament is not excessive, that it is not a party to any international ring of munitions makers and that its Army in the continental area so far from being a colossus is, sad to relate, only about five times the size of the police force of the city of New York. But it is simply because twaddle is not fact that we urge its repeal. Our costly experiment with prohibition would thus help the cause of peace.

Association Affairs

LIEUT. COL. RICHARD H. HAWKINS, Ord. Res., a charter member of the Army Ordnance Association, died at his home in Pittsburgh, Pa., October 12, 1933. Head of the Contract Section of the Procurement Division, Office of the Chief of Ordnance, during the World War, he will be remembered as a talented and devoted officer by all those who served with him and by many individuals who supplied the department with material. His assignment during the war and post-war days was one of exceptional importance. To it Colonel Hawkins gave untiringly of his energy and superb intellectual equipment. He contributed in an outstanding measure to the efficiency of the department. Not only was his war service marked by an unusual degree of success but his achievements in the demobilization period won for him equally cherished memories of fair-dealing in the interests of the Government and the manufacturer.

LIEUT. COL. RICHARD H. HAWKINS, ORD. RES.

Colonel Hawkins was born in February, 1879, at Hawkins Station, Pa., the son of the late Judge William G. Hawkins, Jr., who was president of the Orphans Court of Allegheny County from the time of its organization in 1875 until his death in 1913. Receiving his early education at Shady Side Academy, Colonel Hawkins was graduated from Yale University in 1900, being first honor man of his class. In 1903 he became associated with the law firm of Dalzell, Scott and Gordon of Pittsburgh, and in 1906 a member of the firm of Dalzell, Fisher, Young and Hawkins which later became Dalzell, Fisher and Hawkins, a partnership which continued until he entered the service of the Ordnance Department and took up his residence in Washington in 1917.

Colonel Hawkins entered the Ordnance Department on February 6, 1918, when he was commissioned a captain. His first assignment was in the Legal Branch, Purchase Section of the old Gun Division. When the Department was reorganized he was assigned to the Contract Section of the Procurement Division of which section he was for a time acting head and later chief. He was promoted to the rank of major on July 28, 1918, and became contracting officer for the Ordnance Department in January, 1919. In February of that year he was appointed Chief of the Contract Section of the Administration Division. In June of 1919 he was promoted to a lieutenant colonelcy. In 1921 he was also contracting officer for the Ordnance Section of the War Department Claims Board. He resigned from the Regular Army in September, 1921. Shortly thereafter he accepted an appointment as lieutenant colonel in the Ordnance Reserve.

When Colonel Hawkins returned to Pittsburgh in 1921 he resumed affiliation with the Pittsburgh Law School of the University of Pennsylvania. From his graduation in 1903 he had been an instructor in law at that institution and since 1931 he had been a full-time professor. He was the author of several text books including "Hawkins Common Pleas Practice," "Hawkins Equity Practice and Real Estate" and editor of "Orphans Court Principles of Practice." He held membership in several clubs in Washington, Pittsburgh and New York and was also a member of the Allegheny County, Pennsylvania State and American Bar Associations.

He was the ideal legal counselor to the Ordnance Department during the most strenuous days of its history. While always watchful of the best interests of the department, he gave to its relationships with industry that leaven of kindness and fairness so necessary to the morale of every organization and individual. His name is written large in the annals of American munitions effort during the World War and his memory will be cherished by all who had the good fortune to know him personally and by reputation.

TWO more members of the Army Ordnance Association have been called to important assignments with the National Recovery Administration. Included in the announcement of the appointment of five new members of the Industrial Advisory Board, the body which represents industry before the NRA, are Messrs. Pierre S. duPont, Chairman of the Board of E. I. duPont de Nemours & Company, and Ralph E. Flanders, President of the Jones and Lamson Machine Company of Springfield, Vt. Mr. duPont is a charter member of the Association; Mr. Flanders became a member in 1924. Their service on the board will be for a period of four months in accordance with the "rotation" plan as recommended by board members.

Mr. duPont, one of the nation's leading manufacturers and chairman of the board of the great organization founded in 1802 by his ancestor of the same name, was born in Wilmington in 1870. He received his prepatory education at Penn Charter School, Philadelphia, and was a member of the class of 1890 at the Massachusetts Institute of Technology. In addition to his chairmanship of the board of E. I. duPont de Nemours & Co. he is also a director of the General Motors Corporation, Philadelphia National Bank, and Bankers Trust Company, New York. He is a member of the corporation of Massachusetts Institute of Technology.

Mr. Flanders, a mechanical engineer of national reputation, was born at Barnet, Vt., in 1880. From 1897 to 1901 he was a machinist apprentice and draftsman at Providence and Woonsocket, R. I. In 1903 he designed the plant of the International Paper Box Machinery Company at Nashua, N. H. From 1905 to 1910 he was associate editor of *Machinery*, and in 1912 became director and manager of the Jones & Lamson Company of which he is now president. Through his membership on the National Screw Thread Commission from 1920 to 1924 he came in close contact with design problems of American ordnance. He was a member of the council of the American Society of Mechanical Engineers from 1926 to 1929; in the latter year he was elected a vice-president of the Society. He is the author of "Gear Cutting Machinery" (1909), "Taming of Machines" (1931) and of numerous technical papers.

DURING the summer of 1933 the Cincinnati Post of the Army Ordnance Association adopted a commendable method of stimulating interest in ordnance affairs among our younger citizens when it proposed an award for proficiency in rifle marksmanship at the Citizens' Military Training Camp at Fort Thomas, Kentucky. The award, consisting of a student membership in the Association and the presentation of the Military Medal was conferred upon Mr. Thomas Edward Curran, 508 Center Street, Weston, W. Va.

Students of military problems have often sought methods of encouraging the interest of our younger men in ordnance affairs. The means adopted by the Cincinnati Post is an advantageous way and is recommended heartily to all other posts. The winner of the award at Fort Thomas is now enrolled as a member

of the Association where his proficiency with the rifle is sure to find many opportunities for development.

THE appointment of Lieut. Col. Charles E. Fuller, Ord. Res., as dean of Army students at the Massachusetts Institute of Technology was announced on October 5, 1933, by President Karl T. Compton. Colonel Fuller succeeds the late Col. Edward F. Miller, who held the position for many years prior to his death last June.

Colonel Fuller was graduated from Technology in 1892, and since that time has been a member of the staff in the department of mechanical engineering. He was made an assistant professor in 1900, and in 1906 became associate professor. Previous to his appointment in 1912 as professor of theoretical and applied mechanics, he was for 18 years in charge of instruction in the laboratory of testing materials. Recently he has served as chairman of the committee in charge of graduate courses in his department, and as a member of the committee on the graduate school.

Colonel Fuller has long been interested in the design and construction of ordnance, and has devoted part of his time at the Institute to instruction in ordnance engineering. In 1923 he was commissioned Lieutenant Colonel in the Ordnance Department of the Officers Reserve Corps, U. S. A. He is a member of the Boston Post, Army Ordnance Association.

A prominent figure in engineering and scientific groups, he is a member of the American Society of Mechanical Engineers, the American Society for Testing Materials, the American Association for the Advancement of Science, the American Mathematical Society, the American Geographical Society, the Society for the Promotion of Engineering Education, and the New England Water Works Association.

During the past 30 years he has been actively associated with the development of public utilities in the town of Wellesley, of which he is a resident. ARMY ORDNANCE extends greetings.

COL. THALES L. AMES, one of the best known officers of the Ordnance Department and a charter member of the Army Ordnance Association, retired from active Army service on September 1st of this year. His many friends in Army and industrial life will join in best wishes for him during his well merited rest from active duty.

A native of North Dakota, Colonel Ames was graduated from the United States Military Academy in 1895 and was commissioned a second lieutenant in the Coast Artillery Corps. In 1898 he was detailed to the Ordnance Department in the grade of first lieutenant and from then on filled many important assignments in the Ordnance establishment. He was stationed at the Rock Island Arsenal until 1901. From 1901 to 1903 he was inspector of powder at the California Powder Works at Santa Cruz, Calif. In August, 1903, he was promoted to the grade of captain and served in the Office of the Chief of Ordnance until 1905. His subsequent service included station at the Sandy Hook Proving Ground, 1905-1907; in charge of the General Administration Office of the Manila Ordnance Depot, 1907-1910; Rock Island Arsenal, 1911-1912, and in the Office of the Chief of Ordnance in charge of the Property and Fiscal Division, December 7, 1912, to November 1, 1918. He was promoted to the rank of major in 1908; lieutenant colonel, May, 1917; colonel, January 8, 1918. He was on duty with the American Expeditionary Forces from December 12, 1918, to July 13, 1919. Upon his return to the United States in July of 1919 he served as a member of the Ordnance Department Claims Board until April 14, 1920, when he was transferred to the Springfield Armory and served as Commanding Officer of that establishment until August, 1923. At that time he was appointed Corps Area Ordnance Officer of the 2nd Corps Area with station at Governors Island, N. Y. He served in this capacity until August, 1926, when he became a student officer at the Army War College. In July of 1927 he was appointed Corps Area Ordnance Officer of the 1st Corps Area with headquarters at Boston. Colonel Ames returned to Washington the following year as chief of the Current Procurement Section, Office of the Assistant Secretary of War. The following year he was placed on duty in the Historical Section of the Army War College. On August 1, 1930, he returned to the 1st Corps Area where he resumed his former assignment as Corps Area Ordnance Officer. He held this assignment at the time of his retirement on September 1, 1933.

MAJ. GEN. EDWIN B. WINANS, U. S. A., who recently relinquished command of the 8th Corps Area to Maj. Gen. Johnson Hagood, U. S. A., retired from active Army service on October 31, 1933.

General Winans, whose interest in ordnance is well known, son of a former Governor of Michigan, was born in Hamburg, Mich., October 31, 1869. He was appointed from that state to the United States Military Academy from which he was graduated in 1891, and was assigned to the Cavalry.

Following service with troops in the Indian territory from September, 1891, to September, 1897, General Winans was detailed as Professor of Military Science and Tactics at Michigan Military Academy. From May, 1893, to November, 1898, he was major of the 34th Michigan Volunteer Infantry, and served with it in Cuba. He was promoted first lieutenant of Cavalry, April 30, 1898. In September, 1899, he was ordered to the Philippines, participating in the Philippine Insurrection, and was a transport quartermaster during the China Relief Expedition. He returned to the United States in 1900 and served at various posts in the United States and in the Philippines with the 4th, 5th and 8th Cavalry until 1909. He was promoted captain, Cavalry, February 2, 1901. From August, 1909, to June, 1911, he served as Professor of Military Science and Tactics at Pennsylvania Military Academy. From 1912 to 1916 he served with troops and performed various duties at Fort Riley, Kans., in Hawaii and the Philippine Islands, until he returned to Fort Riley in 1916. During the punitive expedition into Mexico he commanded a squadron of the 7th Cavalry, and received a citation for gallantry in action against Villa's forces at Tohomic, Mexico. He was promoted major, Cavalry, September 2, 1914.

In November, 1917, General Winans was sent to France where he attended the General Staff College at Langres and was later assigned to the 6th Infantry. He was promoted lieutenant colonel February 2, 1917; colonel (temporary), August 5, 1917, and brigadier general, National Army, June 26, 1918. He was assigned to command the 64th Infantry Brigade, 32nd Division, in June, 1918, which position he held until July, 1919, participating with the brigade in the Aisne-Marne, Oise-Aisne, and Meuse-Argonne offensives.

Upon his return to the United States in August, 1919, General Winans served at Fort Riley, Kans., and on February 23, 1920, was promoted colonel, Cavalry. From August, 1920, he commanded the 10th Cavalry in Arizona, until 1922, having in the meantime also commanded for a considerable period the First Cavalry Division. Upon being promoted brigadier general, December 30, 1922, he commanded the 8th Infantry Brigade at Camp McClellan, Ala., until September, 1925, when he was assigned to the 1st Cavalry Division, El Paso, Tex., where he served until promoted to major general on October 18, 1927.

From October, 1927, to February, 1928, General Winans was Superintendent of the United States Military Academy, and commanded the Hawaiian Division later.

General Winans received the Distinguished Service Medal for service in France, with the following citation:

"For exceptionally meritorious and distinguished services.

Is Army Ordnance In Your Local Library?

Members of the Army Ordnance Association who take logical pride in Army Ordnance, the official journal of their organization, have assisted very materially in increasing the circulation of this magazine in recent years. They have done this by securing new members for the organization from among their friends who should be identified with this important work and by giving gift subscriptions of Army Ordnance to public libraries, colleges and other centers of intellectual activity.

Since Army Ordnance is the only American journal devoted primarily to the development, production and supply of munitions, it assumes an essential place in the national defense literature of the day. It may properly be regarded as a source book of information relating to the scientific and engineering progress of American armament and consequently is a necessity for the well equipped library not only for the current reading table but also to be bound and placed for reference on the library shelves.

May it be suggested that you make Army Ordnance available to readers in your local library or to some educational institution in your vicinity?

Send Army Ordnance for one year to:

NAME .....
STREET .....
CITY .....

NAME .....
STREET .....
CITY .....

NAME .....
STREET .....
CITY .....

☐ My check enclosed. ☐ Send notice of gift to recipient.
☐ Bill me January 1st ☐ Bill subscriber directly.

The regular annual subscription rate for subscriptions to Army Ordnance is $4.50 payable in advance; for Canadian and all foreign addresses the rate is $5.00.

ARMY ORDNANCE
Mills Building, Washington, D. C.

He showed marked efficiency and excellent judgment while commanding the 64th Infantry Brigade in the actions at the second battle of the Marne, in the attack and capture of Juvigny, and in the operations at Bois de la Morine, Bois de Chene Sec., and Bantheville Woods. In these actions, by his tactful ability he was always master of the situation and executed his plans with a confidence that was an inspiration to his troops."

He has been awarded a silver star citation for gallantry in action and has received the following decorations from foreign governments: Officer of the Legion of Honor, France; Croix de Guerre, France.

He is a graduate of Michigan Military Academy, 1886, and of the Mounted Service School, 1916.

THAT sterling band of ordnance civilian engineers—all too small in number—was reduced by one a month or so ago when Maj. Harry Hoisington, Ord. Res., for many years a mainstay at the Rock Island Arsenal, was retired from active employment after thirty-five years of Government service. The career of Major Hoisington can be cited not only to recall the splendid service he gave to the Ordnance cause but also as an example of the value of the civilian experts upon whom the technical military services depend in large measure.

Harry Hoisington was born in Michigan in 1873. He was graduated from high school in 1890 and served as an apprentice machinist until 1894. Before beginning his long record at the Rock Island Arsenal he was a journeyman machinist and tool maker for four years. His service at the Arsenal began in June, 1898, and continued until July, 1930, with unbroken succession except for the period from November, 1917, to August, 1919, when he was a captain in the Ordnance Department. While a draftsman Major Hoisington designed the 3.8-inch gun carriage, Model of 1904, and the 2.38-inch field gun carriage. These designs later won for him full membership in the American Society of Mechanical Engineers. Afterward he worked out a rather complicated machine known as the Wire Reel, Model 1907, a device which wound-up wire, the speed of the drum diminishing as the wire increased its diameter.

After the World War Major Hoisington was assigned to duties connected with the establishment of manufacturing tolerances, gage methods, etc., of the new designs for Westervelt Board matériel, the preparation of handbooks on maintenance, assembling and repairs for this equipment. His work on specifications covered the entire field of material produced at the Arsenal. He was retired July 31, 1933, at the age of 60 years, a milestone which his agility and energy disguise.

THE following have been admitted to membership in the Army Ordnance Association since the last issue of Army Ordnance: F. Ahlfeld, Reading, Pa.; Frank A. Belden, Boston, Mass.; Lloyd G. Burmeister, Milwaukee, Wis.; Thomas Edw. Curran, Weston, W. Va.; J. G. W. Dillin, Media, Pa.; William D. Disston, Philadelphia, Pa.; Ervin Greenbaum, Detroit, Mich.; Donald S. Leech, Lima, Ohio; James W. McCook, Jr., Macon, Ga.; M. D. Meiser, Elkhart, Ind.; Robert D. Nations, Washington, D. C.; Robbins H. Ritter, Brookline, Mass.; William J. L. Roop, Melrose, Mass.; D. R. Shepherd, Carnegie, Okla.; Philip W. Smith, Syracuse, N. Y.; Sam E. Smith, Markesan, Wis.; William L. Stephens, Jr., Philadelphia, Pa.; W. Denning Stewart, Pittsburgh, Pa.; Loe A. Sutter, Wichita, Kans.; and H. A. Toulmin, Jr., Dayton, Ohio.

SINCE publication of the last issue of Army Ordnance notice has been received of the death of the following members of the Association: Paxson Deeter, Philadelphia, Pa.; Belford G. Royal, Wenonah, N. J.; T. C. Ward, Pittsburgh, Pa.; and Nicholas Young, Newton, Mass. To relatives and friends of these deceased members Army Ordnance extends condolences.

Professional Notes

BULLETS OF LIGHT

BULLETS shot from a standard Army rifle travel with a velocity of about half a mile a second and are designed to do damage upon impact. Bullets from a remodeled shot-gun at the opening of the recent National Electrical Exposition at Madison Square Garden, New York, had a velocity of about 187,000 miles a second, and did no damage upon impact!

Rifle bullets are deflected by the wind and curved downward by the pull of gravity; the newer bullets travel in an absolutely straight line, irrespective of wind or gravity, and they are flexible, in that one bullet can be of any desired length and can be swept across the whole horizon.

In still another respect do the new bullets differ from standard rifle shots. They are silent. They are bullets of light.

"BULLET OF LIGHT" GUN IN USE

The new light-bullet gun was constructed by vacuum tube engineers of the General Electric Company to demonstrate the versatility of the phototube or "electric eye." In the breech of a nine-gauge shotgun has been mounted a small, powerful light source. It is the bulb ordinarily used as the exciter lamp in photophones, and is rated at 7½ volts and 10 amperes. It is about three-quarters of an inch in diameter and two inches long, and is held in a single-contact automobile-headlight base. Energy for its operation is obtained through a small transformer, in series with which is a time switch which can be adjusted for any interval between a small fraction of a second and thirty seconds. It has been found that at least a half-second is required to permit the filament to assume full brilliancy. The time switch is operated by pulling the trigger of the gun. In the end of the barrel is mounted a small 26-inch focus lens which concentrates the beam of light so that at a distance of 50 feet it is about two inches in diameter. Ordinarily the gun is aimed at the target and the trigger then squeezed. If the timer is set slow enough and if the shooter is fast enough he can correct his aim while his bullet still exists.

The target is a standard photoelectric relay box, with the window in front of the light-sensitive phototube serving as the bull's-eye. When the bullet of light strikes the window of the relay, and thereby the tube, a hit is scored, contact is made by the relay, and a large lamp is lighted as an indication of the hit. A variety of indications could be employed, for the photoelectric relay is capable of actuating many kinds of circuits. It has been found that the gun as reconstructed in this case is capable of use at a distance of fifty feet.

CLOSE-UP OF THE GUN, SHOWING MOUNTING OF LAMP BULB

TECHNICAL NOTES

THE light prime movers, T8 (Chevrolet 6-wheel, 4-wheel-drive) have completed their proving ground test and have been turned over to the Field Artillery at Fort Bragg. The prime movers, T9 (6-wheel, 6-wheel-drive) and T14 (4-wheel, 4-wheel-drive) are still undergoing test at the Aberdeen Proving Ground.

The Commodity Division of the Planning Branch, Office of the Assistant Secretary of War, has held two general meetings of commodity committee-members to review methods of war-time control. A meeting of one commodity committee each week will be held in the near future to discuss type of control applicable to its critical materials.

The point of the standard caliber .50 bullet, all types, is quite blunt, and to determine how much loss in velocity results from this type 100 experimental bullets, made with special sharp points, have been shipped to the proving ground for the purpose of determining the ballistics as compared with standard ammunition.

The 75-mm. gun carriage, M1897, M1E3, is the French 75-mm. carriage with an early design of high speed adapter. A battery has been under test at Fort Sill. The test has now been completed and the carriages are being returned to the Rock Island Arsenal where the experimental parts are to be salvaged and the original parts placed in storage.

A course in the repair and maintenance of fire-control equipment was conducted at the Frankford Arsenal from September 11 to September 30. This was attended by both military and civilian personnel from the various corps areas. Preliminary reports indicate that the course of instruction was timely and interesting and that considerable benefit was obtained by all personnel attending.

ELECTRICAL STANDARDIZATION

CHANGES in regulations covering services and service equipment, conductors, wiring installation design, and emergency lighting are among the major revisions in the forthcoming 1933 edition of the National Electrical Code, the basic national code for wiring in almost all types of buildings. Approval of the new edition as an American standard is announced by the American Standards Association following its submittal by the National Fire Protection Association, sponsor for the project. The code is now the basis for official wiring installation regulations in more than 2,200 communities, a large number of which have adopted it in its entirety.

The following major revisions and additions are outlined by A. R. Small, vice-president of the Underwriters' Laboratories and chairman of the Sectional Committee on the National Electrical Code under American Standards Association procedure:

Article 1: Definitions—a number of changes were made so as to secure conformity with the new proposed American standard definitions of electrical terms, ASA Project C42.

Article 4: Services and Service Equipment—a multiple tenant

building may now have more than a single set of service conductors and service equipment. The omission of insulation on grounded neutral service conductors is permitted for a greater variety of conditions, first recognition of this practice having been recorded in the 1931 text. Similarly, the limitations upon the use of unfused meters placed ahead of the service switch are relaxed somewhat.

In Article 6, conductors, provision is made for a flame-retarding as well as a moisture-proof finish on single conductor circuit wires.

A new type of so-called nontamperable plug fuse is recognized in Article 8, Automatic Overcurrent Protection of Circuits and Appliances.

The regulations for protective grounding in Article 9 are completely rewritten with substantial improvement editorially. The technical changes include wider permitted use of artificial grounding electrodes and, with certain restrictions, the interconnection of a distribution primary lightning arrester grounding conductor with a grounded neutral service conductor.

Article 20: Wiring Installation Design—is a new chapter. Much of its text is lifted from other articles of the previous edition. It seeks to treat of the problem of adequacy of wiring and outlets. It is not settled just when requirements seeking to obtain adequacy for expected future use are beyond the police power. The new provisions are most conservatively stated, partly with this doubt in mind.

Article 41: Emergency Lighting—is likewise new. Provisions, formerly in Article 36, for theatres and the like, have been transferred and a general treatment of the problem of emergency and exit lighting (electrically) is worked out.

Much of the change in Article 50: Circuits and Equipment Operating at More Than 600 Volts—is because of transfer of former text to the chapter on signs and outline lighting and to the new Article 51 on X-ray and high-frequency apparatus. For power circuits the recognized use of high-voltage fuses has been extended. Clearances, both horizontal and vertical, above floors and from working spaces, of live parts at various voltages now appear in table form.

A Good Tractor Test

ADMIRAL BYRD, now starting on his second expedition to the Antarctic, selected a Cletrac crawler tractor to do his heavy hauling at his base of operations. One of these machines, which are attracting considerable attention in military circles, was loaded on the Steamer Jacob Ruppert at Norfolk, Va., when the expedition's supply ship sailed last month. A few months from now this Cletrac will be doing the heavy hauling jobs at Little America, in the land of permanent winter. The Cletrac will be traveling over surface conditions which probably no other tractor has ever been called upon to cover, and will operate in probably the coldest weather man is called upon to experience.

Months ago a representative of the Second Byrd Antarctic Expedition visited The Cleveland Tractor Company, which has been manufacturing crawler tractors for 16 years, and described the conditions that a tractor would meet in Little America. So a Cletrac will be working down where scientists believe that many of the heavy windstorms originate. Snows drifted high by winds of hurricane force and extremely cold temperatures will be some of the conditions the tractor will face. This is the second time that a Cletrac has gone into the frigid zone with a scientific expedition. Sir Hubert Wilkins took one with his expedition in 1929.

Admiral Stanley on the Navy

ADMIRAL WILLIAM H. STANLEY, Chief of Naval Operations, in his two Navy Day addresses, gave a good statement of the case for upbuilding our naval forces. His speech was "a report to stockholders," to use his words. Readers of this Journal, having adequate armament as its principal objective, may be considered "preferred stockholders." They, especially, should be familiar with the state of our Navy. The following excerpts from the Admiral's address will enable them to get and hold the proper perspective:

"Inasmuch as the Chief of Naval Operations under the Secretary of the Navy is responsible for the operations of the fleet and its readiness for war it would seem that his recommendations as to funds necessary to provide the personnel and equipment to man, train, and maintain the fleet in a proper state of readiness would be followed. Unfortunately, due to conditions beyond his control, this is not entirely the case, and so today we find our fleet undermanned, badly in need of repairs and modernization, and with many of its units so old as to be obsolete and useless if pitted against modern ships of the same type.

"This is the condition of our fleet which I feel that you, the stockholders and owners, should know about. I want you to know about it because it is through you that it can be corrected. I want you to know about it lest in not knowing, you may be lulled into a state of false security. I want you to know about it because if, God forbid, war should come, it will be your boys who will go out in these second rate ships to protect your interests, your lives, your flag, your country, and when the accusing finger searches the records in an effort to determine the responsibility for failure to give our fine young manhood a 50-50 chance, I do not propose that the people of the country—the stockholders—can rightfully say the Navy had not brought this situation to their attention.

"The President, as I have already stated, has, in his shipbuilding program under the Recovery Act, and under his announced policy to build up to treaty strength, gone far to overcome our neglect in the building up of our Navy. However, this does not go far enough. With the Navy at treaty strength, provision must be made to maintain it at such strength. This can only be accomplished by the adoption of a sound business-like annual program of building which will not only provide for replacement of ships as they become obsolete, but will keep our Navy modernized and up to date. In addition such a program will, in my opinion, have a very great stabilizing effect upon the economic and industrial activities of the country.

"We must not forget, however, that ships do not make a Navy. In order efficiently to operate a warship she must have a full crew of men and officers. These officers and men must be exercised and trained until they are welded into a highly skilled team, proficient and expert in the handling of the many delicate instruments and machines found on a modern man of war. A full crew signifies that the ship must be able to man and operate at its maximum efficiency every instrument of offense and defense at the same time.

"It is not enough to man the guns and not be able to operate the engines, or to man the main battery and leave the secondary or antiaircraft batteries unmanned, or to man the batteries and operate the engines and leave the damage control parties unprovided for. A ship must be able to maneuver at high speeds and at the same time operate all its guns. The lack of ability to use instantly any of her instruments of offense or defense may mean destruction. At the present moment our ships of war have less than 80 per cent of their authorized complement of enlisted men. Until this complement is increased to at least 85 per cent our Navy is greatly handicapped in its peace-time training, and cannot be considered ready to meet an emergency.

"A fleet of warships is only a collection of ships until its units are trained, operated together and welded into an efficient fighting unit. To keep a fleet efficient requires constant and continuous training, and involves many thousand miles of steaming. All of which indicates that to build and maintain a Navy in a state of readiness adequate to cope with any emergency is

an expensive procedure. On the other hand, to maintain any sized Navy in other than a proper state of readiness is not only rank extravagance but it is to deceive the American people.

"In discussing the Navy and its place in national defense we must not forget the merchant marine. In the broad aspect of sea power the merchant marine holds an important place. Sea power comprises not only powerful ships of war but merchant vessels quickly convertible, when war threatens, into fast auxiliary cruisers, airplane carriers and scouts, manned with trained navigators and seamen available for quickly expanding the Navy personnel,—as well as shipyards and craftsmen skilled in designing and building ships."

IN his second Navy Day address said Admiral Stanley:

"Now what I should like to make most forcibly clear to my audience are three very vital points on the present state of your Navy.

"First, we have not maintained the United States Navy at the 5-5-3 ratio agreed to. We have lagged so behind in construction that we are now way below our quota. Nineteen thirty-three finds our Navy in a poor position relative to the other powers. Considering the treaty provisions, Great Britain and Japan are both in stronger positions and France and Italy have had the advantage of a progressive building program. Now the earnest wish of all thoughtful citizens is that our next Congress will provide the United States with a definite progressive program of ship construction in order that our deficiency, relative to the other powers, may be overcome.

"The second point I wish to make is the urgent need for providing an orderly replacement program for our ships which are now over age, or soon will be. Almost all our destroyers are now obsolete. The other powers know our exact condition in this regard. The treaties require a notification of all countries who signed the treaty whenever a replacement is made. There is no economy in retaining ships in our Navy which are too old to be effective. The upkeep alone on these old ships is an extravagance. The ships of our Navy must be the equal, ship for ship, of any possible adversary. Development of methods of ship construction, armor and guns is so rapid in these days of progress that you must not be satisfied to reckon your Navy's strength in the number of ships alone. The quality of those ships is every bit as important as the quantity. Such a program will, in addition to providing for replacement of ships and modernization of our Navy, have a greater stabilizing effect on the economic and industrial activities of our country than any other one project.

"Thirdly, we must have an adequate number of men to operate our ships efficiently and effectively. Here again we have the factors of quality and quantity. Have no fear as regards the quality of our sailorman. I am convinced and satisfied that our bluejackets are the finest of any Navy in the world. The factor that is so serious and unsatisfactory here is quantity. We have not enough men properly to man our ships. We can easily get them, the finest of American youths. But we are only allowed a number which is insufficient to have our fleet in a proper state of preparation for immediate use.

"Both the first point, as to progressive construction within treaty limits and the second point as regards replacement of old ships are at naught—unless you provide sufficient men properly to operate those intricate and magnificent ships and their airplanes."

A GREAT HISTORIAN

SIR JOHN FORTESCUE, author of the monumental thirteen-volume "History of the British Army," died October 23. He was 73 years of age, having spent 30 years in the preparation of the "History." He was the author of many books, articles and essays dealing with English history, particularly the military phases of it. *The Army, Navy and Air Force Gazette* (London) calls attention to the fact that the History of the Army was carried out under difficult circumstances for it brought greater expense than he could afford and brought him little remuneration. King Edward and later King George both helped towards the production of the work by giving Sir John the appointment of librarian at Windsor Castle. In 1916 he was appointed official historian of the Great War but the task suited neither his taste nor his powers. The last volume of his work, published in 1930, completed the story down to 1870.

It will be recalled that something of a stir was created in 1922 when Sir John visited the United States. He was invited to attend the Armistice Day observance at the U. S. Military Academy. Later the invitation was recalled by the Secretary of War because of certain references in one of Sir John's books, "British Statesmen of the Great War." One of these paragraphs read, "Americans esteem a great bargain even if gained by dishonorable means to mark the highest form of ability." It is too bad action of this sort was taken because, when sailing from the United States, Sir John said that he had planned to make an apology to the Cadets because he had changed his mind.

COST OF GERMANY'S REARMAMENT

ONE billion, two hundred and thirteen million dollars in gold has been quoted as the cost of the eight-year rearmament program demanded by Germany in support of which that country quit the Disarmament Conference and the League of Nations. This figure does not include any expenditure for building a navy —a subject which undoubtedly will come to the fore when the Washington and London treaties expire in 1936.

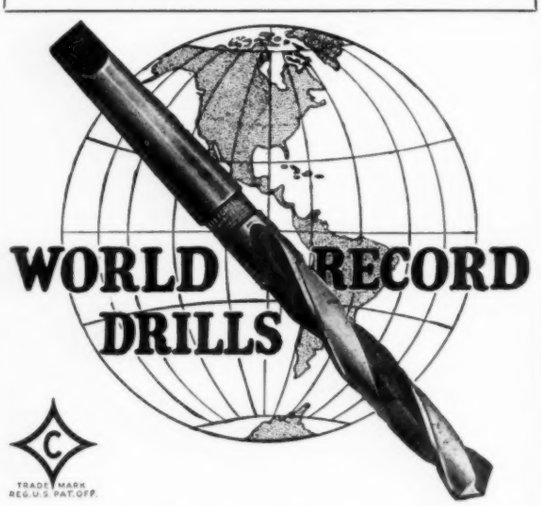
The items for which this sun would be required are said to include: 300 tanks, 100 six-inch guns, 200 six-inch howitzers, 532 three-inch guns, 990 heavy machine guns and 1512 light machine guns, 100 pursuit airplanes, 200 observation planes, and permanent fortifications on the Polish frontier.

MECHANIZATION IN AUSTRALIA

IT has been decided that certain branches of the Australian Military Forces are to be mechanized, according to the *Army, Navy and Air Force Gazette* (London). This policy is designed on a graduated scale in accordance with the limitations of finance and the relative importance of requirements for peace training and war. The mechanization of the Australian Army Service Corps is projected immediately, and will be equipped with 30 cwt. lorries and light vans. Small fleets of these vehicles for the two military districts of New South Wales and Victoria are now available. Owing to the small number of six-wheeled design lorries available for commercial use in the Commonwealth, it is necessary to concentrate on types and makes that are available, and extensive trials with four-wheeled lorries fitted with large section tires are being carried out with very satisfactory results. As regards purely military vehicles such as tanks, "dragons" and semitrack cross-country vehicles, it is impossible to produce these articles in Australia for many years to come, so therefore substitutes must be found or they must be gone without, as their capital and maintenance costs are too high for the funds at present available.

As regards the technical units, one antiaircraft battery in New South Wales has been equipped with high-powered Thornycroft Mark II (Hathi) tractors and vehicles for the battery staff. The field artillery of the two cavalry divisions will now be trained on a mechanical basis, while that of the infantry divisions will continue on a horsed basis. The absence of armored cars is considered a serious deficiency, and as it is not financially possible to supply these at present in sufficient numbers an armored car regiment is to be formed in which the personnel is to be asked to produce 30 cwt. and 2-ton commercial motor trucks in which machine-guns will be mounted on the same principle that light horsemen supply their training mounts.

CLE-FORGE HIGH SPEED DRILLS
TRADE MARK REG. U.S. PAT. OFF.



Since 1924, Cle-Forge High Speed Drills have held the world's records for drilling through cast iron, machinery steel and chrome nickel. Why not send for "Speed and Feed Tests" and Performance Data?

The CLEVELAND TWIST DRILL COMPANY CLEVELAND
NEW YORK-CHICAGO-LONDON SAN FRANCISCO
TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

AOA

Book Reviews

Old Gimlet Eye: The Adventures of Smedley Butler. By Lowell Thomas. New York: 1933. $2.75.

THE name of Lowell Thomas on a book has become a guarantee of a rattling good story of adventure and daring. This, the nineteenth of a line headed by such gems as "With Lawrence In Arabia," "Count Luckner, The Sea Devil," and others, is worthy to join its fellows. In his ability to pick absorbingly interesting subjects, and to handle them with speed and humor, Lowell Thomas has few peers.

The story of Gen. Smedley Butler is of real interest to all readers, but it is especially so to those who are familiar with our services and their personnel. General Butler, by his love of a fight, and by circumstance, has been so much in the news that the many sidelights which this book throws on several famous incidents of his career disclose some rather intimate characteristics of a number of well-known personalities. The book is written throughout in the first person as General Butler tells his own story. This seems to add to the personal nature of the book but does not interfere with a frank appraisal by the reader of the main character.

Butler's courage, moral as well as physical, all the more genuine for his frank acknowledgment of fear, his love of a good fight, his loyalty to his men and to his friends, and his capacity for a great amount of splendid work, is balanced, though by no means overbalanced, by his propensity for getting into personal disagreements, his rather short temper, and by his most unfortunate espousal of "the noble experiment," prohibition. This last, alienated, for a time at least, many of the friends and supporters of the General. But in the opinion of this reviewer, this is more than balanced by the General's frank and hearty contempt for red tape, and for the "white spat" type of diplomat.

Though not, in any sense, a serious textbook, the reading of "Old Gimlet Eye," raises a few serious questions. These are: The difficulty of an officer in our services making adequate progress, on his record alone, and without the use of "pull"; the occasional personal friction within our services; and the great difficulty of maintaining a full measure of discipline in an army, suddenly and enormously expanded as our own must needs be, in event of a major war.

Armaments Year-Book. Special Edition for 1932. Geneva: League of Nations, Conference for the Reduction and Limitation of Armaments. American Agent: World Peace Foundation, 40 Mt. Vernon Street, Boston, Mass. $5.00.

THIS is a special edition of the Armaments Year-Book replacing the ordinary edition which would normally have appeared in May, 1932. It was intended primarily for use of delegates and attachés at the Geneva Disarmament Conference. It differs slightly from year books of the past both in the method of its compilation of data on armaments of the world and in the grouping of the technical aspects of organization and composition of the forces of different countries. Each monograph under the several countries discussed gives a general picture of the military system of the particular country and enables the reader to get a general idea of the main features of the army of that country. Sixty-two countries, both members and non-members

of the League of Nations, are included in the text. No uniform plan is followed in the monographs due to the difference in military systems and the transitional state of the law on armaments in certain countries. In most cases the data are compiled from information supplied to the Secretariat of the League of Nations by the various governments. In cases where this information was not furnished other public and official sources were drawn on.

Because of its intended use at the Geneva Conference this issue of the Year-Book contains two annexes of particular value. One consists of information as to various agreements, treaties, conventions, etc., for the limitation of armaments, and the second contains a recapitulation of tables and graphs giving information as to world military expenditure, world naval tonnage for 1913 and certain post-war years, the principal characteristics of armed forces—standing army, militia, compulsary or voluntary service, etc.

The section of the Year-Book devoted to the United States of America consists of a general statement of the organized peace establishment of the Army, the recruiting system used and a discussion of preparatory military training. For the Navy, figures are reproduced from a communication during June, 1931, from the United States Government giving the status at that time of the various vessels built and building. Finally there is an analysis of actual expenditures for national defense in the United States for the year 1929-1930.

All in all, the Year-Book serves a useful reference purpose by bringing together data not easily assembled from other sources. It is certainly deficient, however, since it is compiled along the lines of those much abused terms "effectives" and "budgetary limitations." And American observers realize just how much abused those terms are. Interpretation of effectives range all the way from the county constable to a major general of the line. We are all too familiar with those queer mentalities who look upon our national budget as an expenditure for national defense. They have the happy faculty of charging the Army and Navy with the cost of everything, it seems, except maybe the franking privilege of Congressmen, the eradication of the grasshopper plague and farm relief. The Year-Book, however, appears to try to do the best it can with an extremely heterogeneous collection of exhibits.

SLANTING LINES OF STEEL. By E. Alexander Powell. New York: The Macmillan Company. $2.50.

OF all the masterly books written by Colonel Powell, "Slanting Lines of Steel" is masterly indeed; it is romantic fact that grips the very heart strings. We propose the concluding paragraphs of the chapter "Death in the Sun" and the entire chapter "The March to Armageddon" as the finest descriptive writing of the World War epic. The author needs no introduction to the general reader, least of all to friends of national defense. His adventures as a war correspondent all over the world, his unique status as the only outside press representative in Antwerp at the beginning of hostilities in 1914, his fearless reporting for the *New York World* of facts as he saw them, these have earned for him the deserved honor of being "one of the few very great war correspondents." His skill in making his unusual war experiences live again makes of this book an indispensible part of the true history of those much debated early war days in Belgium.

None of us cares much these days about what happened in 1914—we are through with war forever, bygones are bygones. So some of us may hope, but hope rests on facts. Facts of the kind related by Colonel Powell will not be forgotten or unceremoniously brushed aside by the people to whom the World War was closest. From a reading of what occurred before the author's eyes one can understand why the much talked-of French forti-

TIMKEN
Tapered
ROLLER BEARINGS
for full anti-friction efficiency and radial-thrust load protection in motor trucks, tractors, tanks, gun carriages and all types of ordnance equipment and industrial machinery.
Timken Bearings carry all loads simultaneously—radial, thrust or both together in any combination.
For over 30 years the standard of the automotive industry.
The Timken Roller Bearing Co.
Canton, O.

A Sure Guide to Mechanical Excellence and Dependability

Carbon and Alloy Steels
Toncan Copper Molybdenum Iron
Enduro Stainless Irons
Pipe and Tubular Products
Toncan Iron Pipe
Electric Weld Pipe
Bars and Shapes
Hot and Cold Rolled Strip, Plates
Black and Blue Annealed Sheets
Galvanized Sheets
Special Finish Sheets
Galvannealed Sheets
Electrical Sheets
Tin Plate
Nuts, Bolts, Rivets, etc.
Die-Rolled Products
Coke, Pig Iron

REPUBLIC STEEL CORP.
General Offices, Youngstown, O.

More Hits, Fewer Cripples

The famous Western Super-X *long range* load is preferred by thousands of hunters—largely because of its exclusive *short shot string* feature. More pellets are effective at the longer ranges. Super-X gives clean kills and fewer cripples. Try it next time you hunt ducks, geese, pheasant or other game.

Brass Mill Division

Western Brass is used by many of America's leading manufacturers in hundreds of products. The Western Brass Mill makes highest quality flat, rolled Brass, Bronze, Phosphor Bronze, Nickle Silver; also special alloys for special purposes. Supplied in rolls, sheets, strips, plates and circles. There are Western Brass Sales Offices in Chicago, Cleveland, Cincinnati, Detroit, Indianapolis, Milwaukee and Philadelphia.

Western Super-X

The Long Arm of the Marshes

WESTERN CARTRIDGE COMPANY, East Alton, Illinois

BERYLLIUM COPPER

A Heat-Treatable Alloy

The American Brass Company... pioneer in this country of such important metallurgical developments as extrusion, die-pressing, piercing, bronze welding, high strength and heat treating copper alloys ...now announces the commercial production of Beryllium Copper.

Beryllium Copper is a truly remarkable metal possessing very high physical properties and differing from other copper alloys in that these physical properties *can be substantially increased by heat treatment.*

Further information sent upon request.

ANACONDA
from mine to consumer

THE AMERICAN BRASS COMPANY

General Offices: Waterbury, Connecticut
In Washington, D. C.: 810 Eighteenth St., N.W.

fications are now realities, why Belgium insists that she will not be violated again, why the other European states are intent upon preventing a recurrence of the scenes of 1914. These good people have reason not to be so forgetful as Americans are prone to be. Their experiences will not be made secondary to pious wishes about "the war to end war."

After his service in Belgium, Colonel Powell became correspondent without portfolio for the *World*. His was a roving commission in war-time England, France and Italy. He returned to the United States "to join-up" when our country entered the fray, started out as a captain of Cavalry in G-2, then to Plattsburgh in the Infantry, then to Camp Lewis, then to France to "Army Post Office 714," the School of the Line and the Staff College at Langres. He saw the war from start to finish. He has written in "Slanting Lines of Steel" an authentic part of the record.

ALWAYS BELITTLIN'. By Percy Crosby. McLean, Va.: Published by the Author. 1933. $2.00.

PERCY CROSBY'S pen has the unique power of driving home a point in most direct fashion. Crosby, the artist, is creating cartoons and drawings of a quality to equal the best anywhere; Crosby, the writer, is fearlessly a champion of national defense. He minces no words in his sponsorship of that cause. This fearlessness, unusual in many of our cartoonists, was apparent in his Skippy's Memorial Day prayer last May 30th.

"Always Belittlin'" contains full-sized reproductions of some of Mr. Crosby's national defense drawings of the past year. Many readers are familiar with some of these cartoons and many may like to have them for preservation. In addition, there are reproductions of some of the Crosby writings which have appeared in the Washington, D. C., papers. The creator of Skippy never takes a middle ground in the attack. He is a fearless fighter on two favorite subjects, for national defense and against prohibition. He has visualized as few other people are capable of doing the hokum and ballyhoo put out so generously by pacifists and prohibitionists. To enter the fray against these wiley opponents is an undertaking worthy of a knight of old. Mr. Crosby is doing his share magnanimously. Believers in the American tradition will hope that he keeps pounding away at the so-called moralists and so-called pacifists. His pen is capable of doing it as few others can. Even though the Eighteenth Amendment is all but out, Major Crosby, Marine Corps Res., has plenty to do for national defense.

COEUR DE LION. By Clennell Wilkinson. New York: D. Appleton-Century Company. 1933. $1.50.

HISTORY would be known more generally if more biographies of the conciseness and directness of this little work by Clennell Wilkinson were the rule and not the exception. Coeur de Lion is more than a favorite hero of troubadors and romancers. He was a soldier-king who, had the intrigues of the latter office been less engrossing, may have gone down in history as one of the world's leading generals. For it was no child's play to achieve as he did the task of leading a Crusade in the twelfth century. He raised 4,000 men at arms and as many foot, embarked them in their 100 transports and sailed to engage Saladin from whom Richard was intent upon wresting the Holy Land. Dashing bravado that he was, King Richard Yea and Nea stopped enroute to conquer Cyprus. This done he sailed on to his objective, scored a victory over Saladin at Arsuf in 1191. The political situation in England required him to return home with the real objective of the Crusade unaccomplished although his truce with Saladin permitted access by Christians to the Holy Places. Romantic times are revived in the pages of this book and a romantic soldier is pictured with all the impetuous vigor and leadership that were Richard's. The

one indelible stain on his record was the massacre of over 2,000 Saracen prisoners at Acre.

We detect in Mr. Wilkinson's treatment of his subject, particularly in the early part, what seems to be a sarcastic note when motives are described. This suspicion however may be more in the style of writing for the author, who also wrote "William Dampier," "Nelson," and "The English Adventurers," already has earned for himself the right to consideration as an historian.

One cannot read a book of this period in man's history without drawing the parallel to our own day particularly as to the cruelty of war. Modernists tell us that modern weapons have made modern war frightful. These scarey ladies and gentlemen are parading "hobgoblins and dead cats," as General Hugh Johnson might say. Modern weapons keep the fighting man further and further away from his assailant. In the days of Coeur de Lion it was close combat always. And the result: in 1099 when the Crusaders entered Jerusalem the streets of the Holy City "ran ankle-deep in blood." The trebuchet could hurl anything as when at the siege of Tortona in 1155 a stone from a trebuchet "fell in the middle of the town, split into fragments against a wall and killed three knights who were standing in front of the cathedral door." Or it might throw a dead monkey —"which is more than modern artillery can do," says Mr. Wilkinson. Which seems to show that man and not his weapons makes war what it is.

Then again there is the parallel about modern weapons, if restricted in size, preventing future conflicts. But back in the days of Richard before disarmament talk fests were popular, Roger of Howden, the chronicler, writing of Coeur de Lion's attack at Cyprus, recorded that the mailed warriors were resisted bravely by the inhabitants who wielded "stakes, bits of wood, slats, boxes—anything they could lay their hands on." Yes, if history as Mr. Wilkinson writes it were better known many people of today would not let themselves look nearly so foolish!

FEDERAL INDIAN RELATIONS, 1774-1788. By Walter H. Mohr. Philadelphia: University of Pennsylvania Press. 1933. $2.50.

IN our standard histories of the American Revolutionary War not much is said, as a rule, about the management of Indian affairs. We run across spasmodic references, mostly to trouble here and there, but for the most part the struggle is depicted in its strategic phases, its economic problems and the goings-on at and behind the lines.

The questions faced by the new American government at the outset of the war was one of great import then and for the future. Should the states or the confederation assume the task of dealing with the tribes? How were purchases of Indian lands to be handled? What agency would be in charge of Indian trade? The purpose of Mr. Mohr's work is to trace the evolution of the federal system for the management of Indian affairs during this preconstitutional period. In its beginnings the problem was faced with the same troublesome difficulties for the American Congress as had marked the regime of the British government.

Mr. Mohr delineates the subject through the period of collapse of imperial control, he discusses the Indian as a factor in the war, the treaties with the Six Nations and the frontier troubles. The negotiations with the northern and southern Indians as parts of the problem of peace are described and the development of a Federal Indian policy (if there ever was such a thing in those days) is indicated. Noteworthy in these steps was a bill introduced in the Virginia legislature in 1784 by Henry. The bill provided that every white man marrying an Indian woman should be paid ten pounds with five pounds

DOTS meet the most Rigid Tests

COUNTLESS times daily DOT FASTENERS are snapped and unsnapped on a host of articles that are a part of the daily life of Army men.

LIKE industry at large, the Army turns to United-Carr—the oldest and largest maker of fasteners in the world—when in need of a fastener for a specific job.

UNITED-CARR FASTENER CORPORATION
Boston Massachusetts
trade (●) mark

J&L STEEL

J&L STEEL PRODUCTS
(OPEN HEARTH AND BESSEMER STEEL)

HOT ROLLED BARS, PLATES AND SHAPES
LIGHT WEIGHT STAIR STRINGER CHANNELS
RAILROAD SPIKES TIE PLATES
Light Rails and Accessories
BARS FOR CONCRETE REINFORCEMENT
FORGING STEEL
JALCASE STEEL
COLD FINISHED STEEL
JUNIOR BEAMS
STEEL PILING
FABRICATED STRUCTURAL WORK
TUBULAR PRODUCTS
Welded and Seamless
WIRE PRODUCTS
TIN MILL PRODUCTS
COKE BY-PRODUCTS

JONES & LAUGHLIN STEEL CORPORATION
AMERICAN IRON AND STEEL WORKS
PITTSBURGH, PA.

TYPE A-4 OXYGEN REGULATOR
FOR
HIGH ALTITUDE FLYING

THESE instruments have been designed to accurately control the flow of oxygen from the tank into the mask of the high altitude flyer.

With the increasing tendency toward flying at higher altitudes these Regulators become an important accessory. The instrument is designed to accommodate one or two persons at will by the mere turn of a lever.

Complete details will be supplied on application.

The Gaertner Scientific Corp.
1201 Wrightwood Ave. Chicago, U. S. A.

ALLEGHENY STEEL COMPANY
GENERAL OFFICES AND WORKS . . BRACKENRIDGE, PENNSYLVANIA

Allegheny METAL CONTROLS CORROSION

Manufacturers of
ALLEGHENY METAL
and a wide range of other
STAINLESS STEEL ALLOYS
For Resistance to Corrosion and High Temperatures

Send for Technical Bulletins
Describing the Physical and Chemical Properties

additional for every child of such a marriage; the Indian husband of a white woman would receive ten pounds, an annuity for his clothing, and education at state expense for all children between the ages of ten and twenty-one. The bill passed the first and second readings but ultimately failed of passage despite the support of John Marshall, later Chief Justice of the United States.

THE GREAT PACIFIC WAR. By Hector Bywater. New York: Houghton Mifflin Company. $2.50.

HERE is a revised rendition of a book by the same author published in 1925. It presents a suppositious war between Japan and the United States, the present situation in the Far East being the reason for this edition. Bywater is a recognized British naval expert, and the present book is based on exhaustive information and data which are treated in a most intelligent manner. The reviewer cannot agree with some of the incidents presented, but as fiction the text presents exceedingly interesting reading matter. Its perusal should lead to a better understanding of the situation in the Pacific, and thus assist in the cause of peace.

A. S. T. M. BOOK OF STANDARDS, 1933. Philadelphia: American Society for Testing Materials. In two parts: Either part $7.50; both parts $14.00.

THE American Society for Testing Materials has just issued its Book of A. S. T. M. Standards, a triennial publication containing all the standard specifications, methods of test, recommended practices and definitions formally adopted by the Society. The 1933 issue of this publication is composed of two parts—Part I containing all A. S. T. M. standards covering metallic materials; Part II, all standards relating to nonmetallic materials. Both parts aggregate 2300 pages.

In both parts of the book, the specifications for a particular class of material are given first, followed directly by the test methods, definitions, etc. A complete subject index is included in which each standard is indexed under the principal subject covered, keywords being given in alphabetical sequence. This index, together with two tables of contents, one listing standards by the materials covered, the other in order of numeric sequence of the designations, greatly facilitates the use of the book.

Of the 185 standards in Part I, 104 cover the ferrous metals, steel, wrought iron, pig iron and iron castings and ferro-alloys, while 70 relate to nonferrous metals, including aluminum and magnesium alloys, copper and copper alloys, lead, nickel, zinc, bearing metals, solder metal, deoxidizers, electrical-heating and electrical-resistance alloys. Eleven of the standards involve metallography and general testing methods. The number of new standards adopted in 1933 for nonmetallic materials totals 37.

$3 for one . . . .

A single room with bath at The Astor—at as low as $3 today—gives—leading hotel service; finest New York location; smarter hotel prestige; larger, airier rooms; comfortable furnishings; the leading hotel value.

Two Persons $4 up Twin Beds $5 up
Discount to all Army Officers

The ASTOR
TIMES SQUARE • NEW YORK CITY